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JANUARY 9, 1932

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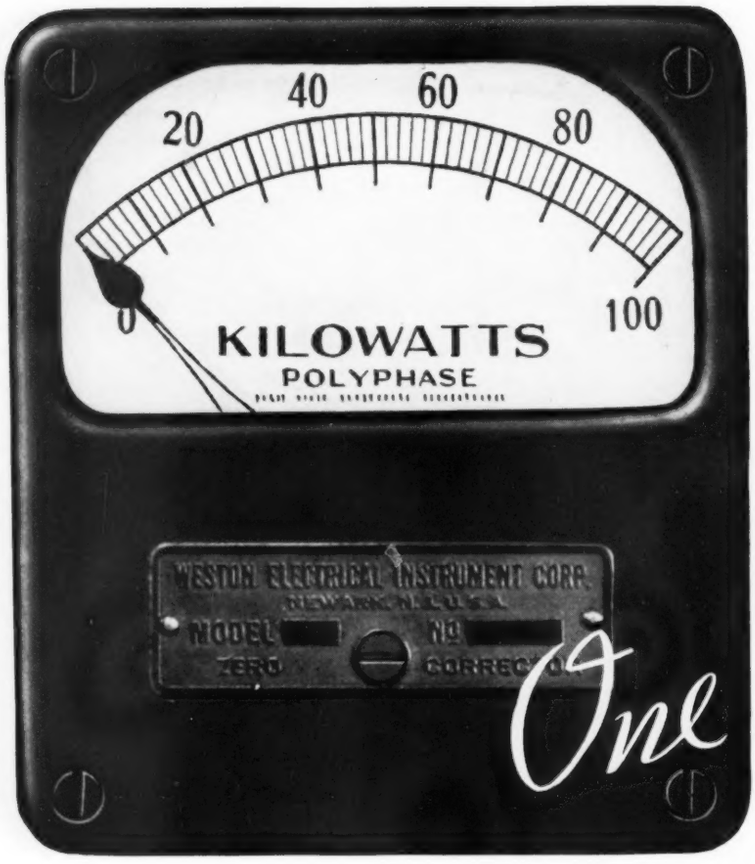

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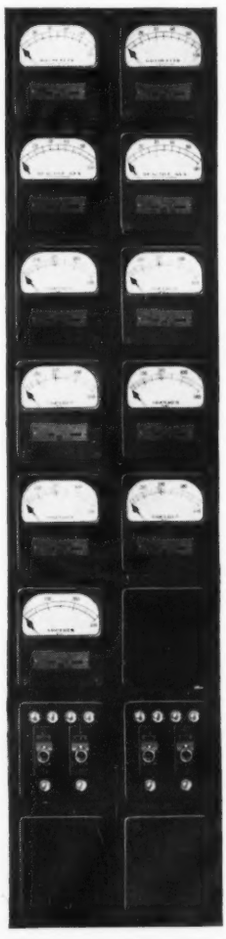
11. Ease of inspection—all instrument and instrument transformer connections accessible at front of board.



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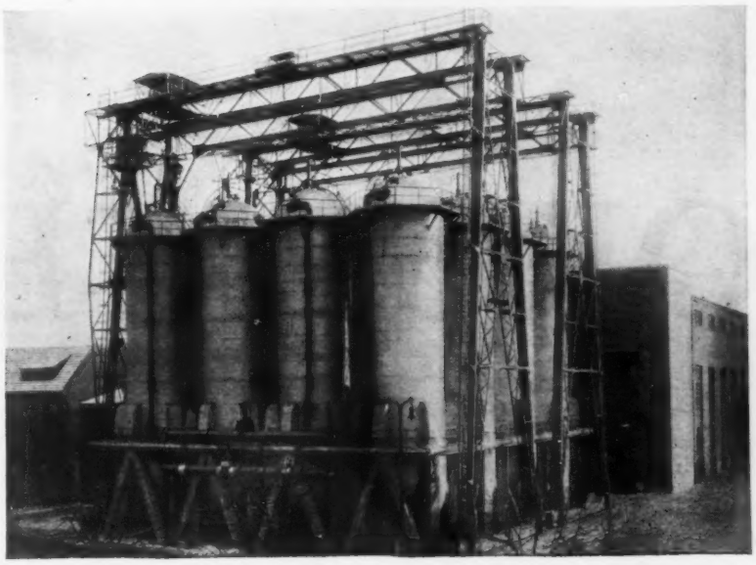

Ruth steam accumulators, Charlottenburg, Germany

JANUARY 9, 1932

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VOLUME 99 . . . NUMBER 2

This Air-Conditioning Business.....90
By W. J. KYLE, *Byllesby Engineering & Management Corporation*

Future Cost of Power.....95
By A. G. CHRISTIE, *Johns Hopkins University*

Industrial Short Cuts May Introduce Hazards.....98
By L. F. LEUREY, *Consulting Electrical Engineer*

Electric Heat a Production Aid in Many Industries.....100

Hygienic Value of Ultraviolet Radiation.....104
By JANET H. CLARK, *Johns Hopkins University*

What About Specifications, Guarantees, Free Consultation?.....109
By M. M. SAMUELS

News of the Industry..... 73
Editorials 86
Grounding Clamp Take-Off Provides Smooth Path to Earth. 91
Concrete Posts with Special Adapters Designed for Boston. 92
Transmission-Line Maintenance Experience and Cost..... 92
Oil-Purifying Systems for Large or Small Substations..... 93
Versatility in Customer Substations 94
Corridor Manholes Serve as Cable Room 99
Tubes Stabilize Jumpers.....105
66-Kv., Three-Conductor Cable Joint 106
Relative Foot-Candles 107
No. 12 Wire Adds Little to Home Wiring Cost.....112
Motor-Driven Blower New Enemy to "Jack" Frost.....112
Men of the Industry.....113
New Equipment Available....116

Electrical World articles are indexed in Industrial Arts and Engineering Indexes, available in public libraries

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ELECTRICAL WORLD

Established 1883. McGraw-Hill Publishing Company, Inc.

for the Week Ending

January 9, 1932

The time has come to stop the waste of public money, or the American business man, already hard pressed by world conditions, will be unable to continue to carry the cost of government.

FRANK D. COMERFORD,
President
New England Power Association.

New England plans for rural service

—**Farm and utility men unite** to discuss problems involved in serving the rural load. President Ferguson of Hartford sees mutual values for both groups and urges action which will develop service and use—*p. 74.*

—**Idaho energy tax again upheld.** Federal District Court sustains state tax of one-half mill on all energy generated within the commonwealth. South Carolina has a similar suit pending in the federal courts—*p. 78.*

Ultra-violet as a doctor sees it

—**Health value of ultra-violet** as a general tonic is as yet undetermined, and optimistic statements as to its value in maintenance of health should be taken with judicious skepticism—*p. 104.*

—**Plan for industrial economies** and avoid the obvious short cut is the warning of one consulting engineer who sees departures from standard practices sometimes proving hazardous and expensive—*p. 98.*

Generation economies depend on use

—**Future power generation costs** depend largely for economies on the betterment made in the use of present demands, according to A. G. Christie. Little saving seen for outdoor plant design—*p. 95.*

—**A period of "write-downs"?** Investment and holding companies cut capitalization by reducing figures at which own stock appears on their balance sheets. The first step in a new era?—*p. 79.*

Roosevelt wants utility districts

—**Versatility of electric heat** proves an important factor in the solution of diverse heating problems in many industries. Economy with full-load use and uniformity of product are best and proved advantages—*p. 100.*

—**Facts about air conditioning** have been presented with a bias by most of those who discussed it, largely because some particular system was advocated. An informative, impartial Byllesby letter clarifies the case—*p. 90.*

New England Farm Bureau and Utility Men Unite to Aid Rural Service

LEADERS in the farm bureau, extension and utility fields convened at Springfield, Mass., on December 31 in the interest of arranging further co-operation in New England in the development of rural electrification during the coming year. F. L. Rimbach, agricultural engineer, New England Power Association, Worcester, presided, and a dozen speakers testified that the way has been cleared for a better understanding between the farm interests and the power companies than formerly obtained. Willard Munson, director of extension service in Massachusetts, in which the federal, state and county governments share costs, made the significant announcement that in 1932 all county agents will be asked to devote a large part of their time to bring the benefits of rural electrification home to the farmers in their districts. The power companies will continue their full co-operation, and increased effort will be made to build up this class of service on an economic basis.

Samuel Ferguson, president Hartford Electric Light Company, pointed out that the secret of successful rural service lies in two essentials, (a) a price so low for electricity that the farmer can make liberal use of energy, and (b) the sale of enough energy by the utility to justify economically the money expended in pole lines. "It is a fortunate fact," said Mr. Ferguson, "that just as surely as a rural customer needs a greater investment to serve him than does the city house, so he is also in need of a far greater amount of service. This greater usage is solving the problem of increased investment. How much greater this usage must be is indicated by the fact that farms located four or five to the mile require about $400 worth of pole line each, whereas city customers located 75 or 100 to the mile need only about $40 worth of pole line each." Mr. Ferguson declared that the defence of utilities against agitators' attacks is consuming energy which might better be employed on farm service problems.

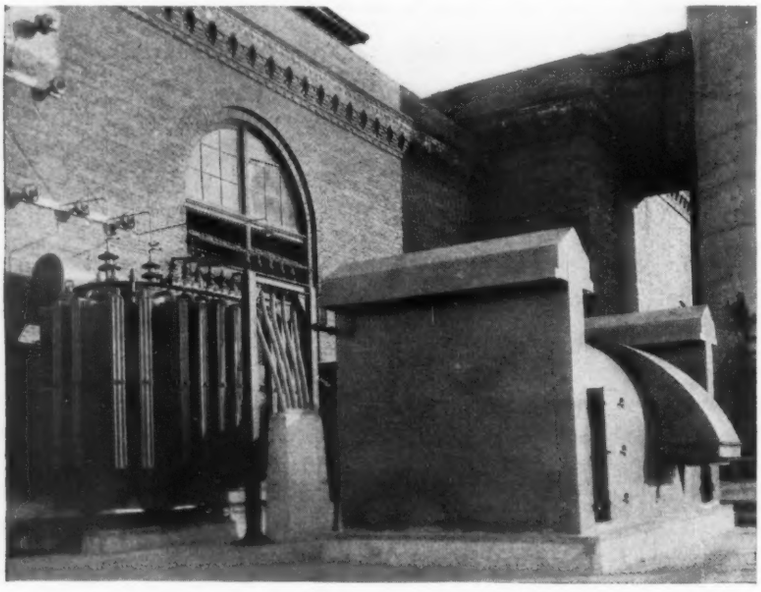
S. M. Buckingham, Commissioner of Agriculture for Connecticut, reported improved co-operation of late between the farming and power interests, and George M. Putnam, New Hampshire Farm Bureau director, told of the good results which have been achieved by establishing line extensions on the basis of a five-year guarantee prorated on a monthly charge.

Prof. C. I. Gunness, Amherst Agricultural College, set forth the value of engineering treatment of farm electrification problems. He recommended that a research problem or other specific advance be the special feature of farm-meeting programs, leaving the electrification issue to be discussed incidentally at popular gatherings. Research is now being conducted on mechanical refrigeration for apple storage, and electric brooders have also been undergoing study in New England. Prof. W. T. Ackerman, New Hampshire State College, outlined the results of the past five years' farm electrification study under N.E.L.A. co-operation. He recommended that every power company appoint an agricultural specialist to carry on farm service work systematically.

F. A. Belden, Boston Edison company, said that over 36 per cent of New England's farms are now electrified, against perhaps 10 or 12 per cent in the entire country. It was announced that a rural electrification institute will be held at Amherst in March and that a rural electrification committee for Vermont was organized last month under the chairmanship of A. H. Packard of Burlington, president of the Vermont Farm Bureau.

▼

THIS IS EASY TO MOVE IF SYSTEM CONDITIONS CHANGE



So designed as to permit, with the maximum equipment salvage, easy transfer to any other system point, this 7,500-kva., 6,900-volt synchronous condenser, inclosed for outdoor operation, possesses accessibility for inspection and maintenance almost equal to the indoor machines. It is at the Kincaid station of the Central Illinois Public Service.

Roosevelt Still Desires Public Utility Districts

Governor Franklin D. Roosevelt devoted his annual message to the New York State Legislature mainly to a discussion of industrial, banking and taxation matters. On St. Lawrence water power and light and power issues he said:

"The Power Authority, created last year, has made definite progress in the performance of the duties imposed upon it by law, not only in working out the respective rights and interests of the four parties principally concerned—namely, the United States, Canada, the Province of Ontario and the State of New York—but also in a further study of the economic and engineering problems and in negotiation of contracts for power distribution.

"In conjunction with the mandate placed upon it by Section 5 of Chapter 772 of the Laws of 1931, directing it to provide a reasonable share of the power to be generated on the St. Lawrence for the use of municipalities and other political subdivisions of the state now or hereafter authorized by law to engage in the distribution of electricity, I desire to recommend to your honorable bodies the adoption of a statute similar to the one which was proposed by me last year, but which failed of adoption, authorizing municipalities of the state to form public utility districts, with

the consent of their voters, for the purpose of generating, distributing and selling electricity."

▼

American Commonwealths Power in Receivership

On application of Daniel Hegarty of New York, and with the corporation's consent, American Commonwealths Power Corporation has been placed in what has been called "friendly receivership." Herbert W. Briggs of New York, Herbert L. Nichols of Chicago and John A. Garrigues of Wilmington have been appointed receivers. The complaint alleged insolvency and inability to meet maturing obligations.

The corporation's principal subsidiary, American Community Power Corporation, was also placed in receivership on the same complaint. Chancellor J. O. Wolcott acted in both cases. Simultaneously with the filing of the bill of complaint, the corporation filed an answer admitting the allegations.

It was stated by officials of the corporation that the receivership was due to the fact that the management did not want to sacrifice any of its securities at present levels to meet immediate demands. While no obligations of the parent company so far have failed to be met, American Community Power Company on November 1 defaulted on $1,800,000 of 5½ per cent notes due at that time. On December 1 General Public Utilities Company, another controlled unit, defaulted on $4,000,000 of 6 per cent notes. The parent company was working out a plan of refunding these obligations which called for a deposit of the notes. Although many of these notes were deposited, there were not enough to declare the plan operative.

Immediate cause of the receivership is said to have been a $3,000,000 short-term loan advanced by Dillon, Read & Company and the U. S. International Corporation which the company was unable to meet. Reorganization of the system is stated to be under way.

▼

Home Markets Lure the Appliance Makers

Attacks on the home market promise to be sharp, short and decisive if the straws now in the wind are of any value as indicators. Ranges and refrigerators are already under pressure in national campaigns. "Only 25 cents a day" for this or that heavy-duty appliance is the first war cry of the embattled salesmen. Lighting, too, will have its purposeful advocates.

Early among the intense attacks upon the lazy outlet and indifferent socket is the Silvray idea. This consists of a Silvray lamp, a silver mirrored lamp for vertical hang-down mounting, for which is provided an attractive indirect lighting fixture of metal, which in use is screwed directly into some fixtureless socket. Installation costs are eliminated. Lamp and fixture go for $1. An energy use increase of 9 to 12 kw.-hr. per month from that outlet is assumed, since only 150- or 200-watt lamps can be inserted in the fixture.

Optimistic promoters figure that the utility will receive from each such unit sold the load equivalent of $65 of refrigerator sales and with no financing problems or charges.

Some weeks ago the Ohio Public Service Company campaigned a home-made unit of similar rating in Sandusky, Ohio, in an endeavor to make profitable the service to some 1,500 minimum bill customers. The idea worked. In four weeks 694 units were sold to the minimum bill customers, with an estimated annual increase in energy use of 35,000 kw.-hr. Here the sale was on the basis of free trial; the cost of the unit is $1, to be paid for at the rate of 25 cents a month, if the customer wants it.

Business Conditions Unchanged

BUSINESS has changed very little in the past week. The heavy industries are still quiet and signs of lower prices for steel products are evident. Electrical products are quiet in the after-holiday lull, but salesmen report the starting of negotiations for substation and distribution equipment, especially where plans were made last year and purchases deferred.

Curtailment of copper production was expected to bring increased prices at the turn of the year, but an absence of buying demand makes it apparent that present prices will prevail for some time. Steel activity still rests at about 22 per cent of capacity and no active demand for automotive or construction purposes is in evidence to change conditions. Even the textile industry is less busy than usual. It appears to be a period of general stagnation and inactivity, in which the electrical industry participates.

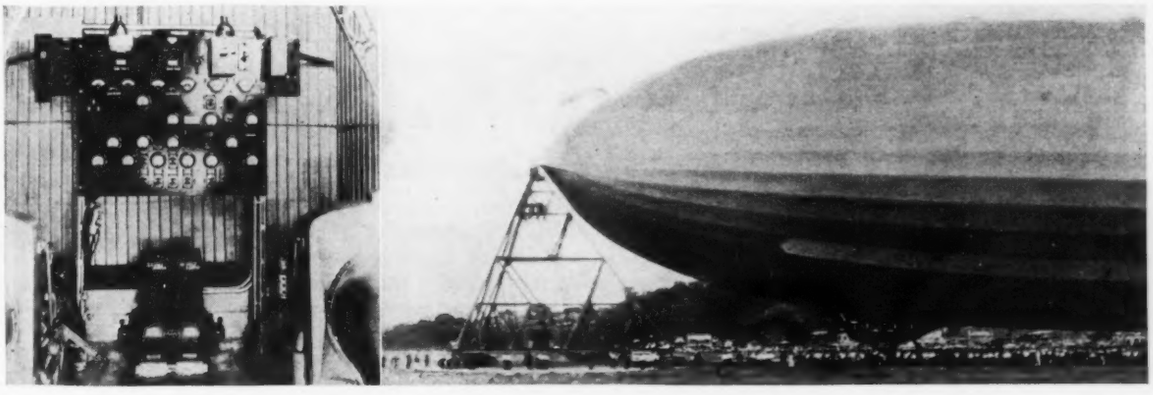
▼

Harding Street Tax Causes Dispute

Assessed for taxation purposes by the county board at $5,000,000, the new Harding Street plant of the Indianapolis Power & Light Company has been revalued by the state tax board at only $1,500,000. The assessor pleads that the company values the plant at $12,500,000.

▼

ELECTRICITY PLAYS IMPORTANT PART IN SAILING AIRSHIP "AKRON"



Below the small micarta switchboard on the left is a set for battery charging, while on the two sides are shown respective portions of the two gasoline-engine-driven 11-kw. generators. On the right is seen the forepart of the ship and the mobile mooring mast which serves both as a tug and an anchor, a 127-hp. motor driving two propelling traction caterpillars. A gasoline-engine-driven generator is installed in a small room in the base of the mast. All the electrical equipment referred to is of Westinghouse make.

ELECTRICITY BRINGS STOCK EXCHANGE TO OFFICE

—Wide World Photos.

Quotations—opening, high, low, close—on every stock listed on the New York Stock Exchange can now be received by a new device called the teleregister in offices fitted out with the service.

▼

Surplus Municipal Power May Be Sold Wholesale

Supreme Court of Washington State Decides, but Poor Bond Market Damps Public Ownership Plans

Through a decision of the Washington State Supreme Court on December 28 corporate cities of Washington have the right to sell their surplus municipal power to other towns. The court's decision denied an appeal of the Bremerton Municipal League, which sought an injunction to restrain Bremerton from entering into contract for purchase of Tacoma's surplus power. Tacoma, Bremerton, Centralia and Puyallup all were concerned in the opinion, as each city proposed to buy or sell surplus power. Tacoma and Centralia have proposed to exchange surplus energy. Bremerton and Puyallup had taken steps toward construction of municipal power plants. The decision may also lead to considerable development for Seattle's municipal plant. When each large unit is added in the Skagit development there is a surplus, according to Superintendent J. D. Ross, and communities between the Skagit and Seattle are anxious to get this power. Seattle's right to exchange power with the Tacoma municipal plant was attacked in the suit.

"All cities have the power to purchase electrical energy from outside territorial limits," the court said. "There is no showing of want of power to sell or purchase the surplus electrical energy." The opinion concerned wholesale, not retail, sales. By its terms it is evident that municipalities may sell surplus energy to other municipalities or to any power districts that may be set up under last year's act, but the finding does not appear to legalize the retailing of power by municipalities to individual customers.

Failure by both Bremerton and Puyallup to market their utility bond issues led to the reversal of policy in the former city noted last week (page 5) whereby the voters, by a bare majority of 47, renewed the Puget Sound Power & Light Company's franchise for ten years. Reduction of the company's rates in the western Washington territory (ELECTRICAL WORLD, December 26, page 1119) has also helped to modify public-ownership sentiment.

▼

Bay State Governor for Regulating Holding Companies

Renewing his recommendation of a year ago, Governor Joseph B. Ely advocated the passage of a measure to regulate holding companies in his address this week to the incoming Massachusetts Legislature. He contended that the sale of holding-company stock to the public upon excessive valuation of underlying properties and securities of the basic utilities places the state in an embarrasing situation as to regulation.

Under these conditions, the Governor said, "the regulatory power finds itself confronted with the necessity of allowing rates in excess of the theory of reasonable investment in order to protect the prices for which the shares of the holding companies were sold to the public. If we regulate the holding companies now, we shall prevent this abuse in the future." In view of the evident belief of the Massachusetts commission that the regulation of rates, capitalization and service of operating companies provides the necessary basic supervision on behalf of the state, it is unlikely that any major legislation looking toward the regulation of holding companies will find favor in the near future in the Bay State unless unforeseen developments occur this winter.

▼

Intercompany Contention Goes on in St. Louis

In a brief just filed with the Missouri Public Service Commission the Laclede Power & Light Company of St. Louis again makes emphatic protest against the application of the Union Electric Light & Power Company for permission to acquire and hold about 26 per cent of the voting-trust certificates of the Laclede company, covering 3,330 shares of stock. With such a purchase the Union company would gain the right to a place on the Laclede company's directorate. In its brief the Laclede company contends that the purpose of this proposed acquisition is "to hamper, interfere with and to a certain degree destroy the free and active competition between the companies."

The city of St. Louis also has objected to the Union Electric's acquiring an interest in a competing company. In a brief filed in reply, the company says its minority interest is harmful neither to the rival company nor to the public.

The Union Electric Light & Power Company has, moreover, now filed a brief with the Public Service Commission in support of its new schedule of rates, filed last September, for steam-heating service which would limit such service to its electrical customers exclusively. It again contends that this rule is necessary to protect the company from the inroads on its business by the Laclede Power & Light, charging that the Laclede company is attempting to take away the Union company's profitable wholesale electrical customers and that such a condition would gravely injure the Union Electric. "The approval of this new schedule will block the Laclede's effort to raid Union electrical business," the brief states. It goes on to challenge the right of the Laclede Power & Light to "conduct any electrical business, and especially outside of the so-called Keyes district, in the city of St. Louis."

Bill to Scan Utility Rates Fails at Harrisburg

On December 30, the final day of the special session of the Pennsylvania Legislature, an unsuccessful effort was made to have the Assembly indorse an investigation to obtain decreases in public utility rates. The attempt was made in the House on resolutions sponsored by two Allegheny members. Each was defeated decisively without a record vote, but not until debate had produced unexpected results.

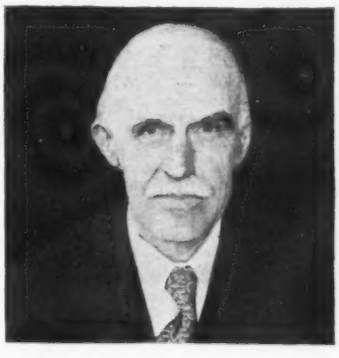
Representative Staudenmeier, Schuylkill, who championed the Pinchot fair rate board bills through the intensive battle of the regular session, opposed the resolutions. "This is not the time to have an investigating committee running around rampant," he warned. He declared that enforced rate reductions would "slow up" extensive improvement programs launched by Pennsylvania utilities and would "endanger jobs." Representative Turner, Delaware, also said that a legislative demand for general reductions in rates would endanger the stability of the industry.

Representative Rhodes, Monroe, asserted that all other commodity prices have dropped while utility rates remain at peak-price levels. "The Public Service Commission could be more diligent in inquiring into rates," he asserted.

▼

Maltbie Tells Temptations of Holding Companies

In forbidding limitations of voting rights to certain classes of stock forming part of an issue for which approval was asked recently by the Lowville Gas Corporation, Milo R. Maltbie,



chairman New York Public Service Commission, gave expression to certain dangers which he saw in the control of large utility properties by owners of holding companies having only a limited investment in these utilities. He said in part:

It was stated to us that the promoters of the Lowville company contemplated the construction of a number of plants in various places in this state and elsewhere, that they wanted to control the local corporations through a small investment in each, and that they might drop their plans for the construction of a plant in Lowville unless they were permitted to do so. The issue thus raised was that unless the promoters of the Lowville Gas Corporation were allowed to control this and other corporations in this state through the investment of a small amount of money, they might not build plants.

Of course, there was but one answer to such a proposition. It would be better that no plant be built than that a financial plan should be approved which might easily be made to work injustice to investors. Unless those responsible for the conduct of a corporation have a substantial investment in the property, there is every temptation through management, engineering and purchasing contracts to mulct the local corporation and to place in the coffers of the holding company funds which ought not to have been so diverted. . . .

It may be said that under the present law holding companies are subject to investigation and limited control by this commission. But that is no justification for the approval of a plan which is fundamentally wrong and invites improper relations. This commission may not be expected to protect stockholders against their own acts or failures to look after their own interests, but it can and should see that when a corporation is organized provision should be made whereby stockholders may, if they desire, control the operations of a company which they own and in which they have placed their funds.

In a separate opinion supporting the finding Commissioner George R. Van Namee said:

Whoever may be the ultimate owners of operating utility companies, or wherever the control of such companies may lie, the commission can see, and it is its duty to see, that the charges for the product are not unreasonable and that the public receives safe and adequate service. It may be that the legislation already enacted to control holding companies is not sufficient to eradicate the evils that are known to exist, but certainly it is not for the commission itself to admit that it cannot control these corporations; and, as one who believes in public regulation, I cannot admit that we are powerless in the situation.

▼

Kansas City, Kan., Finishes New Unit

Virtually complete, the new 10,000-kw. turbo-generator at the municipal light plant of Kansas City, Kan., will soon be in full operation. The plant addition contains also a 6,000-hp. boiler, which will be followed, perhaps this year, by a twin piece of apparatus. The new construction has cost $1,500,000 and has been paid for from accumulated earnings and without the necessity of floating any bond issues.

Coming Meetings

National Electrical Manufacturers' Association—New York, Jan. 11-15. A. W. Berresford, 420 Lexington Ave., New York.

American Engineering Council—Washington, Jan. 14-16. L. W. Wallace, 744 Jackson Place, Washington, D. C.

American Institute of Electrical Engineers—Winter convention, New York, Jan. 25-29; district meeting, Milwaukee, March 14-16. F. R. Hutchinson, 33 West 39th St., New York.

Conference of Electrical Leagues—Philadelphia, Jan. 25-27. Society for Electrical Development, 420 Lexington Ave., New York.

North Central Electric Association—Commercial Section, Lowry Hotel, St. Paul, Jan. 29 and 30; Engineering Section, St. Paul Hotel, St. Paul, Feb. 22 and 23. J. W. Lapham, 803 Plymouth Bldg., Minneapolis.

National Electric Light Association—Group committee meetings: Engineering National Section, New York, Feb. 1-5; Accounting National Section, Statler Hotel, St. Louis, Feb. 15-17. A. J. Marshall, 420 Lexington Ave., New York.

National Association of Purchasing Agents—Public Utility Group, Birmingham, Ala., Feb. 18-20. G. A. Renard, 11 Park Place, New York.

Oklahoma Utilities Association—Tulsa, Okla., March 8 and 9. E. F. McKay, 1020 Petroleum Bldg., Oklahoma City.

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Federal Power Accountant Once More a Storm Center

Trouble has broken out afresh over the pre-license accounts of hydro-electric companies seeking licenses from the Federal Power Commission. This time the utility is the Alabama Power Company, from whose statement of capital costs for the Mitchell Dam William V. King, the commission's chief accountant, sought to squeeze about $3,900,000. Mr. King, it is reported, sought to introduce evidence comparing the Alabama Power Company's costs with those of two other companies — the Southern California Edison and the Pacific Gas & Electric —by which he wanted to prove that the Alabama company's costs were exorbitant and were the result of transferring fees from one subsidiary to another. He had at previous hearings brought about the elimination of $322,000, part of which was said to cover fees to lobbyists at Washington.

The present fight is based on the assertion that the Alabama Power Company has written up the value of its water-power rights $3,500,000 and has charged to administration and construction expenses $411,000 which it paid to itself or to a subsidiary. The attorney for the Alabama Power Company objected to Mr. King's testimony and to the admission of his comparative costs, said to show that the California companies built projects at a price much less than that of Mitchell Dam. Chairman G. O. Smith of the commission, apparently convinced that some of Mr.

King's testimony was irrelevant, ordered the omission of more than 50 pages of it from the transcript, the stenographer being ordered to keep his notes of the part omitted, subject to transcription at the order of the commission.

The agitation in Congress over Mr. King's testimony on accounting procedure before the old departmental Power Commission and subsequently over his dismissal (afterward rescinded) by the new board will be remembered.

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Federal Court Sustains Idaho Energy Tax in Full

Final decision in the appeal by the Utah Power & Light Company against the law passed in 1931 by the Idaho State Legislature imposing a tax of 0.5 mill per kilowatt-hour on all electrical energy generated in the state was rendered on December 31 by the United States Court for the District of Idaho. The law had previously been sustained as regards consumption of electricity within the state boundaries, but decision was withheld on its constitutionality where power was exported to other states. The court has now upheld the law in its entirety, stating that the generation of energy is akin to manufacture and precedes transmission, that the energy can be measured before it enters transmission, and that therefore the tax does not interfere with interstate commerce.

Virtually identical laws were passed last year by the Legislatures of Vermont and South Carolina. In Vermont no appeal was taken. In South Carolina the chief light and power companies appealed to the federal courts, which have not yet rendered a decision.

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American Participation in Paris 1932 Congress

Recording deep regret because of the death of Dr. L. T. Robinson, its secretary, the American committee of organization for the International Electrical Congress to be held in Paris next June elected Dr. Harold Pender to that office at a recent meeting. It had been filled in the interim by T. A. Worcester, who was unable because of other duties to continue to act. Dr. E. W. Rice resigned as chairman, because of expected absence from his office, and was made honorary chairman, Dr. A. E. Kennelly being selected for the active chairmanship.

A revised list of about 60 papers and reports to be given by Americans at the congress was presented. Omitting a few marked "tentative" or "uncertain," it is as printed on this page.

As already explained in the ELECTRICAL WORLD (July 4, 1931, page 4), the coming International Electrical Congress will be the fourth large gathering of this nature to be held—the previous ones having met at Chicago in 1893, Paris in 1900 and St. Louis in 1904. This year's congress has been organized by four French associations under the auspices of the International Electrotechnical Commission, with national committees for participating nations.

INTERNATIONAL ELECTRICAL CONGRESS

Paris, June, 1932

AMERICAN REPORTS AND PAPERS

Section I—Science of Electricity and Magnetism.

"Electric Discharges in Gases at Low Pressures," Irving Langmuir.
"Experimental Study of Cathode Rays," W. D. Coolidge and C. N. Moore.
"Ferro-Magnetism in its Theoretical and Practical Aspects," T. D. Yensen.

Section II—Electrical Measurements

"Determination of the Absolute Value of the Ampere," H. L. Curtis.
"The Silver Voltameter," G. W. Vinal.
"Measurements and Standards of Inductance," H. L. Curtis.
"Determination of the Ratio of Electromagnetic Units to Electrostatic Units," N. E. Dorsey.
"Potentiometers," H. B. Brooks.
"Resistance Measurements," F. Wenner.
"Practical Magnetic Measurements," R. L. Sanford.
"Watt-hour Meters," W. H. Pratt.
"Measurement of Surges," J. F. Peters.

Section III—Production and Transformation of Energy

"Survey of Progress in Electrical Machinery in the United States Over the Past Fifty Years," P. L. Alger and F. D. Newbury.
"Production and Transformation of Electrical Energy," F. A. Allner, A. D. Bailey, A. G. Christie and F. C. Hanker.
"High-Voltage Transformers," F. F. Brand.
"Transformers," H. V. Putman.
"Grid Control Applied to Large Mercury Rectifiers," H. D. Brown.

Section IV—Transmission and Distribution of Energy

"Stability of Power Systems," R. D. Evans and D. F. Wagner.
"Lightning and Its Effects," D. L. Fortescue.
"Lightning," F. W. Peek.
"Extinction or Arcs in Power Circuit Interrupters," Joseph Slepian.
"Oil-Blast Principle of Arc Interruption," D. C. Prince.
"System Overvoltages and Their Protection," W. W. Lewis.
"High-Frequency Communication Along Power Lines (Carrier Current)"; T. Johnson, Jr.
"Power Transmission and Distribution," P. H. Chase, H. R. Woodrow, D. M. Simmons and W. W. Lewis.

Section V—Electric Traction, Mechanical Applications

"Motors and Equipment for Electric Traction in the United States," H. L. Andrews and F. H. Shepard.
"Evolution and Development of Railway Electrification in the United States," E. L. Moreland.

Section VI—Electric Traction, Mechanical Photometry

Comprehensive single report. The president of the Illuminating Engineering Society has been asked for his recommendations.

Section VII—Electrochemistry, Electrometallurgy, Batteries

Report by the Electrochemical Society.

Section VIII—Wire Communications

"Phenomena of Long-Distance Telephone Cables," H. S. Osborne and A. B. Clarke.
"World-Wide Telephony, Its Problems and Future," F. B. Jewett and Bancroft Gherardi.
"Carrier-Current Telephony in Transmission Lines,"* T. Johnson, Jr.

*This report is the same as No. 10, Section IV.

Section IX—High-Frequency Phenomena

"Frequency Control of Radio Waves,"† C. A. Priest and Frank Conrad.
"Very Short Waves, Generation and Maintenance by High-Frequency Oscillations," I. E. Mouromtseff and W. C. White.
"Television and Telephotography," H. E. Ives.
"Photo-Electric Cells," H. C. Rentschler.

†Subject to change.

Section X—Electrophysiology

"Modern X-Ray Tubes and Generating Apparatus," W. D. Coolidge and E. E. Charlton.
"High-Tension Apparatus for Energizing X-Ray Tubes." Charles Weyl.
"Methods of Determining the Intensity of X-Rays," L. S. Taylor.
"Effect of Electricity on Living Beings," W. B. Kouwenhoven.
"Radiothermy," W. R. Whitney.

Section XI—Atmospheric Electricity, Terrestrial Magnetism

"Correlation Between Solar and Terrestrial Magnetic Activities," J. Bartels.
"World Distribution of Magnetic Observatories and Secular Variation Stations," J. A. Fleming.
"Systems of Natural Electric Currents in the Earth and Their Relations to Variation in the Earth Magnetism," L. H. Gish.
"Relation of Diurnal Magnetic Variation at the Huancayo and Waterloo Observatories to the Electric Current Systems of the Upper Atmosphere," H. F. Johnston and A. G. McNish.

Section XII—General Applications

"Electric Drive for Large Pumps for Public Works," A. E. Beardmore.
"Measurement of Dissipation of Vibrational Energy in a Steel Rod by Electrical Means," A. E. Kimball.
"Stroboscopy," D. D. Knowles.
"Noise Investigation and Measurement in the United States," H. B. Marvin, C. R. Hanna and S. K. Wolf.
"Economic Value of Industrial Furnaces," W. S. Scott.
"American Arc Welding—Design and Construction," A. M. Candy and J. G. Ritter.
"Electrical Appliances for the Home," Frank Thornton.
"Application of Electricity to Various Industries," J. D. Wright and R. H. Rogers.
"Application of Electricity to Steel Mills, Textiles and Dyeing," G. E. Stoltz.
"Application of Vacuum Tubes to Industry," W. R. King.
"Recent Progress in Telemetering," R. J. Wensley.
"Commercial Alternating-Current Time Service and Synchronous Motor Clocks," H. E. Warren.

Ask Receiver for American Equities

Petition for the appointment of a receiver for American Equities Corporation, utility holding company, was filed last week by Emil Mautner, owner of 1,500 shares. The petition alleges mismanagement, recklessness, waste and unsound judgment by officers and directors. It is alleged that on July 30, 1931, a statement listed assets as of April 30 at $37,038,746. Since then, it is stated, receivers have been appointed for several subsidiary and affiliated companies, and losses to the corporation have made it impossible for it to meet its obligations, it is alleged.

The charge also states that loans amounting to $1,716,317 were made to officers and directors of affiliated concerns and that, as a result of mismanagement, the corporation has or will become insolvent, and will not be able to meet current obligations.

The officers of the American Equities Corporation, according to the petition, are Burton A. Howe, president; Warren H. Snow, vice-president; George W. Cain, secretary and treasurer; R. Van Horn, assistant secretary and treasurer, and P. D. Crockett, assistant secretary. The directors are Messrs. Howe, Snow, Cain, G. W. Treat, Thomas J. Walsh, J. H. Bridge, Donald O. Malveny, E. Walker, George N. Lindsay, Philip J. Gossler, Robert C. Hunt, F. J. Leary, A. McAndrew, J. B. Miller, R. S. Morris, E. B. Robinet, William H. Wildes and W. W. Freeman.

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Investment Companies Writing Down Securities

Are the utilities beginning to undertake a writing down of capitalization similar to that already accomplished by many industrial concerns? The action of a few companies may suggest a trend in this direction.

But analysis shows that action has been and is likely to be confined to holding or investment companies seeking merely to ratify what the market has already achieved by liquidation. General Public Service Corporation, for example, recently reduced the stated value of its stock and transferred the difference to surplus. American Commonwealths Power announced its intention to reduce the stated value of its class A and B stock from $10 to $5 before the receivership petition was filed against it. The investment unit of General Electric Company, Electric Securities Corporation, has reduced its capitalization from $42,500,000 to $23,750,000 through the surrender and cancellation of common stock by General Electric Company. This step allows the writing off of portfolio losses.

In the industrial and financial fields the practice of reducing capitalization is a common one. It is usually the first step in a writing down of property account in keeping with the general shrinkage in values. The actual process by which it is usually carried out is, first, a reduction in capital stock, both in totals and in stated value per share, then a transfer of the difference to surplus account. This is sometimes earmarked in a special reserve, from which dividends may not be paid. The surplus account is then frequently called upon to reduce the balance sheet valuation of assets to more conservative figures. Manufacturing concerns generally have followed the policy of writing off their capital investment rapidly. But in the case of utility operating companies there is no indication that such a policy will be undertaken.

Niagara Falls Power Company and some of its operating affiliates announced the reduction of their capitalization last week. This was merely the last step, however, in the retirement of preferred stock commenced four years ago. It has no relation whatever to recent market liquidation. Niagara Falls Power retired 800,000 shares of preferred stock, Niagara, Lockport and Ontario Power Company retired 500,000 shares of preferred stock and Tonawanda Power Company reduced its capital from 80,000 to 50,000 shares.

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Utility to Increase Capital

Stockholders of the Central West Public Service Company have approved an increase in the authorized capital stock by an additional 100,000 shares of $100 par preferred stock and 300,000 shares of no-par preferred stock. The $100 par preferred stock will have the same preference and voting power as present outstanding class A and B preferred stocks of this company.

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Stocks at New Low Levels

THE magic of a new year, the easing of call money after year-end strain, the promise of constructive federal legislation—all have failed to lend courage to potential security buyers. Instead, further dividend cuts and new bankruptcies have strongly suggested caution and stock averages early this week touched new low levels for the depression. A sustained buying movement, however, appeared later in the week, inspired by hopes for the institution of the Reconstruction Finance Corporation.

Bonds begin to show greater stability, but little incentive yet appears for appreciation. Member bank selling fortunately seems to have dried up. In the last quarter of 1931 member bank holdings of U. S. government and other securities declined by well over half a billion dollars. But liquidation of failed banks still creates heavy selling. How much of this has been absorbed one cannot say, accurately. Until it is completed, and the failure of additional banks arrested, there is nothing to justify any sustained rise in the bond market.

Furthermore, insurance companies, normally among the largest buyers of bonds, have more money on loan to policy holders than ever before. President Frederick H. Ecker of the Metropolitan Life said recently that such loans amounted to 32 per cent of all investments of his company in 1931. This greatly reduces the ability of these buyers to buy bonds.

Is the Bond Market Oversold?

Lack of Confidence Now Only Large Factor Preventing Strong Buying Movement

THE balance which will be struck between two dominant economic factors is going to determine the course of the bond market in the early part of 1932. One factor is the huge volume of cash and liquid assets in the hands of individuals and institutions — probably the largest total on record. The other is the fear complex which has seized potential investors and which has reduced confidence, hence buying, to a minimum.

Banks and insurance companies have an unusually strong cash position. These institutions as well as individuals have persistently declined to make commitments in a falling or uncertain market, and they have reduced running expenses as well. A financial leader stated this week that any sudden, miraculous disappearance of this fear and some unexpected adjustment of world financial tangles would almost immediately induce a bull market rivaling that of 1928-29. But few anticipate any such miracle. How the investor should regard the current market has been concisely summed up by C. W. Sills, vice-president of Halsey, Stuart & Company. Mr. Sills says:

No one can say whether the trend of bond prices in the immediate future will be upward, or still farther downward; but, from the strict investment point of view, the correct answer to this question is not of vital importance. Investment is concerned less with profit than with sound security and income at a fixed rate, regularly paid; it is concerned less with hopes of the future than with the realities of the present.

To the investor with unemployed funds who is groping for light as to how they can most advantageously be employed, the following propositions should recommend themselves for serious consideration:

(a) That the bond market at present offers many opportunities for the investor to secure extraordinarily high rates of income.

(b) That in the past history of the bond market such opportunities have recurred only at relatively long intervals.

(c) That the most acute stages of bond market depression have not usually been of long duration.

(d) That there has never been a severe general depression in the past history of the country when a great many people did not suspect that the world was on the threshold of disintegration.

(e) That only an infinitesimal percentage of those who in the past have sought to buy at the bottom have accomplished their purpose—for rarely indeed has the turning point of any price movement been definitely recognized before it already lay some distance behind us.

With regard to the utility bond market, the major influence is still the general situation and the market as a whole. Last year's power and light company earnings warrant much higher prices than those now quoted. It is difficult to see how even the worst predictions of some alarmist economists could seriously affect utility bonds. Present prices in this field would seem to offer unusual opportunities unless the general situation becomes decidedly worse. Many long-term obligations of the strongest operating groups are selling in the lower nineties. According to credit standing, they range all the way down to the sixties. The gradual improvement of business conditions should bring this group towards par more quickly than any other single group.

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International Power Postpones Dividend

Because of the present impossibility of marketing securities due to the prevailing condition of the market, both in London and New York, International Power Company, Ltd., will postpone payment of the quarterly dividend on its 7 per cent preferred shares due at the present time.

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American Cities Defers Dividend Too

American Cities Power & Light Corporation has deferred action on the dividend on the class B stock, which would have come up for consideration at this time. The regular dividend on the class A stock was declared for payment February 1 to stock of record January 5.

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Public Utility Maturities in 1932

Public utility corporation bonds and notes maturing in 1932 aggregate $507,354,490, according to a compilation made by Dow, Jones & Company. This figure represents the largest total since the records were begun and twice the 1931 total. The next highest total was $432,934,890, recorded in 1922. A feature of the coming maturing of obligations is the large amount of one-year notes, totaling approximately $140,400,000.

Light and power companies are well represented in the maturing activities scheduled for 1932. The accompanying table gives the details.

Due		Public Utility Issue of:	Rate	Amount
January				
Jan.	1	Montreal Lt. Ht. & Pwr. 1st.	4½	$6,326,000
Jan.	1	Canadian Niagara Pwr. deb A	6	4,980,000
Jan.	1	Niagara Falls Pwr. gen.	6	4,749,000
Jan.	1	Georgia Ry. & Elec. cons.	5	4,453,000
Jan.	1	Niagara Falls Pwr. 1st.	5	3,743,500
Jan.	1	Canadian Niagara Pwr. deb C	6	1,500,000
Jan.	2	North Boston Lghtg Pwr. 3-yr.	5	3,500,000
Jan.	2	Ontario Pwr. 1st	5	208,000
Jan.	3	Midland United notes	4	917,000
Jan.	3	New England Elec. Secur. clt.	5	500,000
		January total		$30,876,500
February				
Feb.	1	American Pub. Utilities 5-yr.	6	$1,100,000
Feb.	1	Texas Pwr. 1-year	6	225,000
Feb.	2	Puget Sound Elec. Ry. cons.	5	2,427,000
Feb.	3	Midland United notes	4	917,000
Feb.	15	New Eng. Pwr. Assoc. serial.	5½	360,000
		February total		$5,029,000
March				
Mar.	1	Burlington Ry. & Lt. 1st	5	$1,419,000
Mar.	1	Assoc. Public Utilities 1-yr.	5½	1,350,000
Mar.	1	Midland United notes	4½	917,000
		March total		$3,686,000
April				
Apr.	1	East St. L. & Suburban Co. clt.	5	$7,997,000
Apr.	1	Electric Pub. Utilities 1-yr.	6	3,000,000
Apr.	1	North Amer. Lt. & Pwr. 1-yr.	4½	2,000,000
Apr.	1	Domin Pwr. & Transm'ion 1st	5	1,802,000
Apr.	1	Fulton Lt. Heat & Pwr. 1st.	5	289,000
Apr.	3	Midland United notes	4½	917,000
Apr.	15	Duke-Price Power 5-year	6	3,500,000
		April total		$19,505,000
May				
May	1	Huron Lt. & Pwr. 1st.	6	$227,000
May	3	Midland United notes	4½	917,000
		May total		$1,144,000
June				
June	1	United Light & Rys ref.	5	$11,000,000
June	1	Middle West Utilities serial	5	10,000,000
June	1	Evansville Gas & Elec. Lt. 1st	5	1,030,000
June	1	Northeast Utility Assoc. 1-yr	5	800,000
June	1	Carolina-Georgia Service 5-yr.	6½	348,000
June	1	Northern California Pwr. 1st.	5	336,000
June	1	Selma Lighting 1st	5	238,000
June	3	Midland United notes	4½	917,000
June	15	Staten Island Edison 1-year	3	7,500,000
June	15	N. Bedford Gas & Ed. Lt. 1-yr.	3	4,500,000
		June total		$36,669,000
July				
July	1	Toho Elec. Pwr. 3-year	6	$11,450,000
July	1	Federal Public Service 3-year	6	5,500,000
July	1	Wisconsin Valley Elec. 1-year	4½	4,000,000
July	1	Wisconsin Public Service 1-yr.	4	2,500,000
July	1	Eastern Utilities Assoc. 3-yr.	4½	1,144,700
July	1	East Coast Utilities 2-year	6	900,000
July	1	United Gas & Elec. 1st	5	676,000
July	1	Muncie Elec. Lt. 1st	5	580,500
July	3	Midland United notes	4½	917,000
July	15	Rochester Gas & Elec. 1-yr.	3	10,000,000
July	15	Saxon Public Works 2-year	5	10,000,000
July	30	Commonwealth Edison 1-year	3½	20,000,000
July	30	Public Serv. of No. Illinois 1-yr	4	15,000,000
		July total		$82,668,200
August				
Aug.	1	Public Serv. Nor. Illinois deb.	5	$10,000,000
Aug.	1	Pennsylvania Elec. 1-year	3½	9,000,000
Aug.	1	Central West Pub. Serv. 3-yr.	7	1,000,000
Aug.	1	New Milford Pwr. 1st	5	1,000,000
Aug.	3	Midland United notes	4½	913,000
Aug.	15	General Gas & Elec. serial	5	2,950,000
		August total		$24,863,000
September				
Sept.	1	Iowa Ry. & Lt. ref.	5	$6,572,000
Sept.	1	Union Elec. Lt. & Pwr. 1st	5	6,200,000
Sept.	1	Indiana Elec. 1-year	4½	2,500,000
Sept.	1	Iowa Ry. & Lt. ref.	8	1,000,000
Sept.	1	Iowa Ry. & Lt. ref.	7	500,000
		September total		$16,772,000
October				
Oct.	1	Edison Elec. Ill. of Boston 1-yr	4½	$20,000,000
Oct.	1	Wichita R.R. & Lt. cons.	5	1,493,000
Oct.	1	Guanajuato Pwr. & Elec. 1st.	6	802,000
		October total		$22,295,000
November				
Nov.	1	Edison Elec. Ill. of Boston 2-yr	4	$20,000,000
Nov.	15	Western Utilities 1½-year	5½	2,500,000
		November total		$22,500,000
December				
Dec	1	Toledo Lt. & Pwr. 2-year	5	$35,000,000
Dec.	1	New England Pwr. Assoc. 2-yr	5	20,000,000
Dec.	1	North Boston Ltg. Prop. 1-yr	5½	7,500,000
Dec.	1	San Diego Cons Gas & El. 1-yr	4½	1,500,000
		December total		$64,000,000

91,650,000,000 Kw.-Hr. U.S.G.S. 1931 Estimate

Electric public utility plants, including those for traction and others contributing to the public supply, as well as central stations for light and power, generated 7,382,890,000 kw.-hr. in November, the Geological Survey reports. This is 4 per cent less than the output a year ago, and compares with 7,741,247,000 kw.-hr. in October, which was 6 per cent less than in 1930. Average daily production in November was 1 per cent less than in October.

Output from water power was 2,090,642,000 kw.-hr., or 28 per cent of the total for the month. In October this source supplied only 2,043,153,000 kw.-hr., or 26 per cent.

Of the nine geographical regions none had a greater output than in October and only one, the South Atlantic, a greater than in November, 1930.

Changes in per cent compared with 1930 were as follows:

	October	November
New England	—3	—5
Middle Atlantic	—3	—2
East North Central	—11	—7
West North Central	—1	0
South Atlantic	+1	+2
East South Central	—14	—13
West South Central	—3	—1
Mountain	—18	—16
Pacific	—7	—6
United States	—6	—4

The total production of electricity by all public utility plants in the United States in 1931, as estimated by the Geological Survey on the basis of the first eleven months, was about 91,650,000,000 kw.-hr., or about 4½ per cent less than in 1930. Production in 1930 was 1½ per cent less than in 1929, while the average annual increase from 1919 to 1929 was about 10 per cent.

Water power contributed about 30,000,000,000 kw.-hr. in 1931, about the same amount as in 1927 but with one-third more installed capacity in hydro-electric plants. These figures, it is pointed out, indicate in a general way the effect of the drought on production from water power.

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Utilities Power & Light Earnings Maintained

With an increase in gross earnings from its British properties and a decrease of only nine-tenths of 1 per cent in the gross of its American utility properties, Utilities Power & Light Corporation for the twelve months ended September 30, 1931, shows public utility earnings to have been maintained on practically an even basis with the corresponding previous twelve months.

Net income available for dividends was $6,325,028, equivalent to $38.92 per share on preferred stock, $3.22 per share on class A stock and 56 cents per share on class B and common stock outstanding, as compared with $8,007,911 for the twelve months ended September 30, 1930, when the applicable earnings equaled $49.27 on the preferred stock, $4.71 per share on the class A stock and $1.32 per share on the class B and common stock respectively.

The loss in net income in the face of maintenance of nearly equal gross earnings from utility operations was largely due to losses encountered in non-utility operations, which includes the St. Louis Gas & Coke Corporation, engaged in the pig-iron business, which industry has been at a low ebb in the year past.

Atlas Utilities Buys Block of Goldman, Sachs

The rapid expansion of Atlas Utilities Corporation continues with the acquisition of the largest stock interest in Goldman Sachs Trading Corporation, it has been announced.

Atlas Utilities portfolio includes large utility holdings. During the past year this organization grew from a $20,000,000 to an $85,000,000 trust chiefly by acquiring control of other general management trusts such as Chatham Phenix Allied Corporation, Sterling Securities Corporation, Ungerleider Financial Corporation and National Securities Investment Company.

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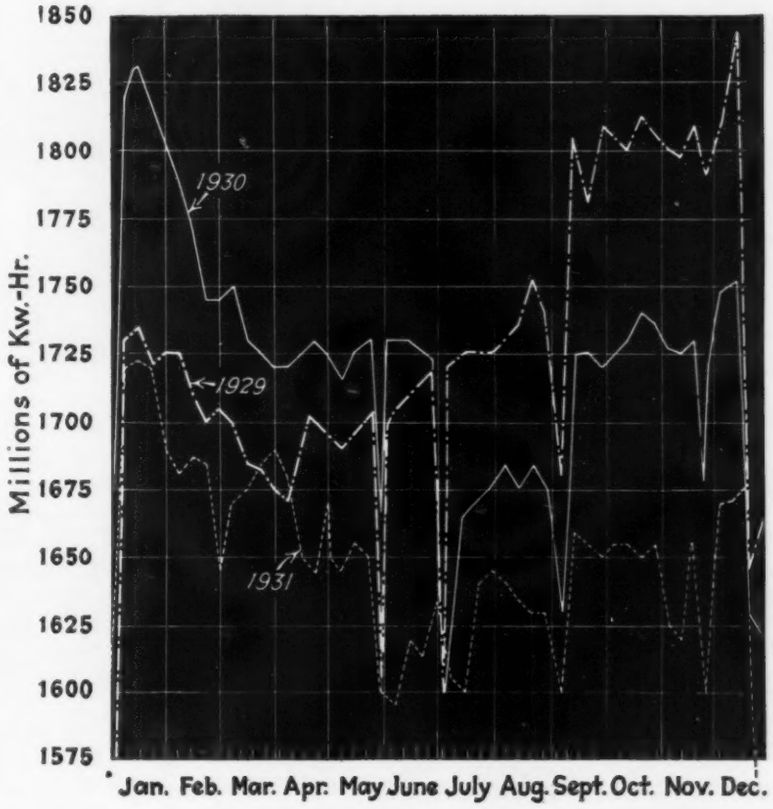
Holiday Week Brings Decreased Output



ENERGY output of electric light and power companies during the week ended January 2 fell off 0.3 per cent compared with Christmas week and 4.6 per cent against the corresponding week a year ago. Comparable figures, in millions of kilowatt-hours, as reported by the National Electric Light Association are given in the table. The output continues to be somewhat smaller than it was last winter, the difference during the past three weeks being successively 5.3, 3.3 and 4.6 per cent.

Regionally the latest report shows a moderate relative downward change from the preceding week on both seaboards, little change in the mid-West and a slight improvement in the Chicago territory. Compared with last year the decrease, in per cent, was: Atlantic seaboard 2.0, New England alone 1.7, the central industrial region 7.0, Chicago district alone 4.4, Pacific coast 7.0.

	1931	1930	1929	1928
November 28	1,600	1,672	1,718	1,619
December 5	1,671	1,747	1,806	1,706
December 12	1,672	1,748	1,841	1,716
December 19	1,676	1,770	1,860	1,710
December 26	1,565	1,617	1,638	1,527
	(1932)	*(1931)*	*(1930)*	*(1929)*
January 2	1,524	1,597	1,680	1,542

Copper Survey Discusses Salvaging of Metal

Much light has been thrown on one of the most disturbing factors in the copper situation by the report of J. W. Furnes, chief of the minerals division of the U. S. Bureau of Foreign and Domestic Commerce, in a survey of the flow of scrap copper and brass back into industry. The importance of this salvaging operation is demonstrated by the fact that, except in three refining plants, no strictly virgin copper is produced in the United States today. Purchases by primary smelters of scrap and clippings with a content of 140,000 tons of recoverable copper were equivalent to one-fifth of the production of refined copper from domestic ore, amounting to 696,000 tons in 1930. Small wonder that secondary smelters and brass plants depending largely on scrap resent this invasion of the market furnishing their raw material requirements.

Scrap copper stocks low

Purchases of scrap by the secondary smelters totaled 112,000 tons, copper content, in 1930. This figure is regarded as abnormally low owing to prevailing business conditions. That accumulated stocks were heavily drawn upon is indicated by a previous report of the U. S. Bureau of Mines placing the production of copper by secondary smelters at 527,000 tons. Relatively there are no stocks of secondary copper on hand in this country today.

Purchases by secondary smelters included 36,000 tons, copper content, of scrap classified as crucible, No. 1 copper wire, heavy copper and wire mixed. One of the largest buyers was the Western Electric Company, subsidiary of Bell Telephone. Western Electric manufactures from these classes of scrap wire bars that, drawn, now largely supply the parent company's requirements for copper wire. Purchases by brass plants of secondary copper and brass amounted to 60,000 tons of recoverable copper in 1930.

In covering for the first time the purchase of the secondary raw material the survey defines the close relationship between the primary and secondary sources of supply. Extensive data on the origin of scrap and the amount available in a given district will enable those engaged in the trade to determine whether they are obtaining their proper quota. A study of the movement of scrap as traced in the survey also will indicate strategic points where partial fabrication of raw scrap material would make possible a much wider distribution.

New York Metal Prices

	Dec. 30, 1931 Cents Per Pound	Jan. 7, 1932 Cents Per Pound
Copper, electrolytic	7.25	7.25
Lead, Am. S. & R. price	3.75	3.75
Antimony	6.25	6
Nickel, ingot	35	35
Zinc, spots	3.475	3.45
Tin, Straits	21.70	21.13
Aluminum, 99 per cent.	23.30	23.30

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WESTINGHOUSE EXECUTIVES RETURN FROM EUROPE

Just off the SS. "Bremen," Loyal A. Osborne (left), president Westinghouse International, and A. W. Robertson, chairman Westinghouse Electric & Manufacturing. Mr. Robertson interviewed Mussolini. A patent interchange with the Marelli Company of Italy has been arranged.

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Canada Sets Duty on Electric Fixtures

A value for duty purposes on electric fixtures, portable electric lamps and shades has been set by the Canadian Minister of National Revenue. Such articles invoiced at $3.25 per unit or less will have their values advanced by 33⅓ per cent. When the invoiced value is greater than $3.25 per unit the added value will be $1.10 per unit. The unit is regarded as the separate fixture, lamp or shade and each must be invoiced separately.

The values do not apply to importations purchased in good faith before December 22 and imported or entered at customs on or before January 22.

Westinghouse Pays 62½-Cent Dividend

Westinghouse Electric & Manufacturing Company declared a dividend of 62½ cents a share on the common stock and the regular quarterly dividend of 87½ cents on the preferred, both payable January 30 to holders of record January 18. In the preceding quarter dividends of 62½ cents were paid on both the common and preferred stocks. The preferred shares are entitled to $3.50 annually before the common receives any dividends. After both classes receive $3.50 they share future dividends equally.

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General Electric Makes Refrigerators at Erie

Another step forward in the plans of the General Electric Company to concentrate all refrigeration manufacturing in Erie, Pa., has been completed, it was announced a few days ago by A. M. Sweeney, manager of refrigeration production, as the new $300,000 refrigerator cabinet warehouse at Erie was placed in use.

For two years the company has been striding in this direction, and now all refrigerator cabinets are manufactured in Erie. Compressor units are manufactured in Schenectady, N. Y., and Fort Wayne, Ind. As conditions warrant the move, however, it is planned that the production of compressor units also will be concentrated in the Pennsylvania city.

The warehouse, construction cost of which was less than that of any building the General Electric Company has ever erected for its own use, is 400 ft. long and 350 ft. wide, has a storage capacity of 70,000 cabinets and is the last word in modern warehouse construction. The steel framework was electrically fabricated, welding having been done in the shop and field with General Electric welding equipment.

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Further British Duties on Electrical Goods

The third order made by President Walter Runciman of the British Board of Trade for the restriction of abnormal importations under the new abnormal imports act has just been issued, and is effective as from December 19. It imposes a 50 per cent ad valorem duty on the following electrical goods:

(a) Electrical incandescent filament lamps for 20 volts and over and parts thereof.

(b) Fittings and accessories of the

kind used in interior electric lighting systems, of the following descriptions: Brackets, pendants, candelabra and electroliers and fittings therefor, ceiling roses, fuse holders and bases, fuse and distribution boards and boxes, lamp holders, lanterns, shades, bowls and reflectors and fittings and holders therefor, sockets, plugs, adaptors and connectors, switches, table and floor standards, as well as part of any of the above.

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Electrical Work Helps Create Employment

The Electrical Guild plan for increasing electrical work and giving employment to now unemployed electricians is to be put into effect in Portland, Ore., through machinery established by organized labor in co-operation with about twenty electrical contracting firms. The plan contemplates solicitation of property owners to induce them to add to, modernize, or repair their electric wiring. Solicitation will be carried on by members of the local electricians' union not now employed.

In so far as possible prices on frequently recurring classes of work have been standardized. In cases where the customers have not specified a particular contractor the job will be apportioned by a committee composed of representatives of labor and representative contractors.

Los Angeles to Go Ahead with 60,000-Kw. Plant

Announcement was made on December 22 that the Los Angeles Board of Water and Power Commissioners would immediately call for bids for the construction of a 60,000-kw. steam generating plant at Wilmington, Los Angeles Harbor, as foreshadowed in the ELECTRICAL WORLD for December 5 (page 986). Estimated cost of the plant, to be the first unit of a proposed three-unit power house with ultimate capacity of 180,000 kw., is $7,000,000. The municipal water and power department has on hand approximately $1,000,000 for its construction, and, according to the plan, the balance is to be paid for out of earnings. The city's present generating capacity is entirely in hydro-electric plants, and the Southern California Edison Company has supplied the bulk of its requirements.

Refusal of a request from the southern California division of the President's Organization for Unemployment Relief that $3,000,000 loaned by the city of Los Angeles to the Board of Water and Power Commissioners be returned to the city's general fund to be used in speeding up unemployment relief has brought caustic comment from those who dispute the board's statement that the request could not be granted without crippling the municipal power system. The Los Angeles *Times* says: "Instead of meeting its obligations, the Power Bureau has taken a leaf from the European notebook and will spend the money on armament; that is to say, on a steam plant not needed for the production of electricity but long desired to provide jobs for the Power Bureau's political henchmen and to carry on a fight with the Southern California Edison Company."

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Consumers Power Builds Modern Croton Substation

Several unusual features mark a recently completed substation at the Croton hydro-electric plant of the Consumers Power Company in western Michigan. Among these, according to H. N Fox of the compan'ys electrical engineering department, writing in the company's publication, the *Au Sable News*, the flat type of bus construction, the use of aluminum conductors and the oil-handling system are noticeable.

The new substation has connections for five 140-kv. lines, one from the Manistee River hydro plants, one from Hardy; one to Muskegon and two to Grand Rapids. The flat type of bus construction is a departure from the company's other 140-kv. substations, where the high, vertical type prevails. The flat type improves the accessibility of all parts of the station, it being un-

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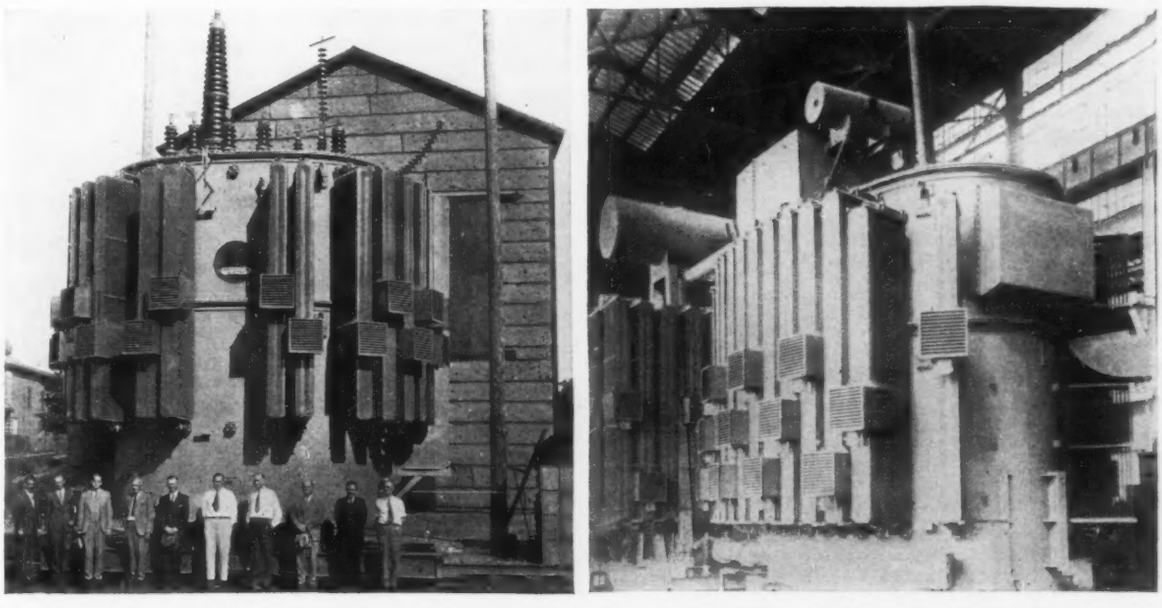
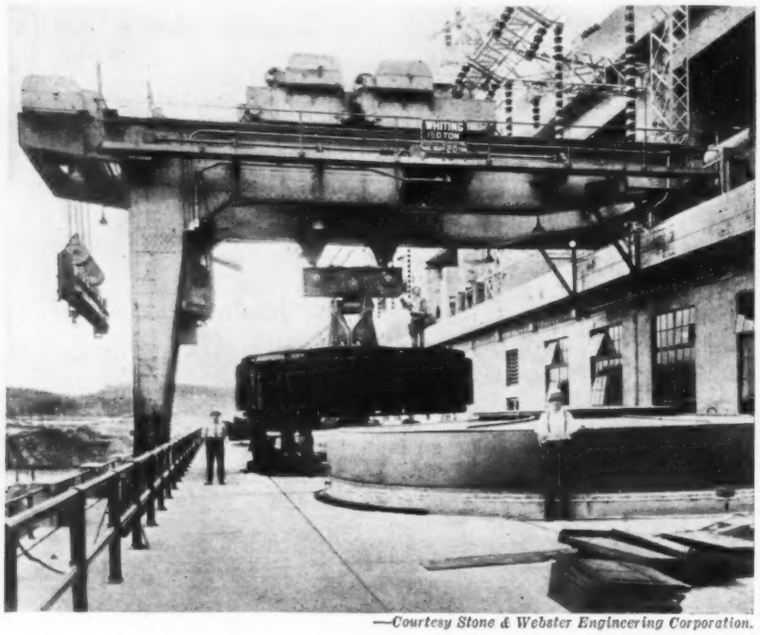
MODERN TRANSFORMERS OF GREAT SIZE FOR SAFE HARBOR AND HELL GATE



The 42,000-kva. Westinghouse lightning-proof transformer (tested against 3,500,000-volt artificial surges) on the left is for the Baltimore end of the transmission line from the new Safe Harbor hydro plant. The 70,000-kva. transformer on the right has been shipped from the Westinghouse works at Sharon, Pa., to the Hell Gate station in New York. Despite its size, an improved design made unnecessary any special shipping arrangements.

ACCESSIBILITY A FEATURE OF BAGNELL GENERATORS



—Courtesy Stone & Webster Engineering Corporation.

This 150-ton gantry leg crane with 30-ton fixed-outboard stop-log hoist serves six 21,500-kw. units at the new Osage (Mo.) semi-outdoor plant of the Union Electric Light & Power Company. A hoisting speed of 6 ft. a minute is possible in handling 150-ton loads.

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necessary in any instance to install the buses above other energized equipment. Its use is economical where sufficient inexpensive property is available. Aluminum tubing is particularly adapted to this type of construction, which requires relatively long spans between bus supports. Many of the spans at Croton are 37 ft. long, and to carry this length of tubing in copper would require an excessive amount of material. Sleeves packed with "dry ice" are used in joining sections of the tubing.

In handling oil a buried header system with outlets adjacent to all of the large oil-filled equipment is used. There is a buried storage tank of 8,700 gal. capacity, and the pump can transfer oil from any oil-filled apparatus to or from this tank.

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Detroit Edison Will Spend $9,000,000 for Construction

The Detroit Edison Company expects to spend about $37,000,000 during 1932. This is in addition to what will be required for interest and dividends to bondholders and stockholders. Of this amount more than $28,000,000 will be required for the operation and maintenance of the company's power plants, substations, lines and other company property; from $8,000,000 to $9,000,000 will probably be required for new construction work.

The largest item in the 1932 construction budget is for the completion of the Connors Creek switch house at the power plant on Lycaste Avenue, opposite the head of Belle Isle. This new switch house will replace the present switching equipment in the plant, which has become obsolete. This project is the first step in rebuilding the entire Connors Creek plant. The switch house was started in 1930. It will be put into commission some time in 1932, but the rebuilding of the power plant will require at least seven or eight years to complete.

When entirely rebuilt the Connors Creek power plant will probably have four tandem-type turbo-generators of approximately 120,000 hp. each, with provision for adding a fifth of the same capacity, should that ever prove necessary. As an intermediate step, two noncondensing turbines of approximately 20,000 hp. will be installed to operate in cross-compound with the old 60,000-hp. machines Nos. 4 and 6. Two of the 120,000-hp. units, already mentioned, would replace this combination of cross-compound turbines. According to present preliminary plans, the turbines will operate on steam at a temperature of 825 deg. F. and 600 lb. pressure.

Additional substructure work is now being installed at Delray power house No. 3 to accommodate three additional turbo-generators and six more boilers, or double the present capacity of the plant. The substructure work will be completed in 1932, but additional superstructure and equipment will not be installed until it is needed to provide for growth in load. Substructure work requires a great deal of time and it is therefore well always to have some of it finished in view of future requirements.

A new 65,000-hp. turbo-generator for Delray power house No. 3 was purchased in 1931, and while this will probably not go into service until 1933, a considerable amount may be spent in 1932 for piping and electrical connections which will have to be installed before this machine is ready for service. This will be the third unit of its kind to be installed at Delray and will complete the first half of power house No. 3. The company has seven other identical machines at its Marysville and Trenton Channel plants.

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Japanese Buy Equipment for Pipe Factory

A complete set-up of machinery for manufacturing large-diameter steel pipe by the electronic tornado process of automatic welding in a shielded arc has just been ordered by the Asano Dockyard Company of Japan from the Lincoln Electric Company of Cleveland, Ohio. Installation of this machinery will be supervised by T. Y. Inagaky, Tokyo representative of the Lincoln Electric Company.

This, the second order in the past six months for a pipe factory installation of this kind in Japan, follows the successful operation of the same type of equipment in the Kobe plant of the Kawasaki Dockyard Company.

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Safe Harbor-Holtwood-Baltimore Ring Complete

Delivery of power from Safe Harbor to utilities in Pennsylvania began on January 3, when the new hydro plant was interconnected with the transmission lines of the Pennsylvania Water & Power Company which supply companies serving the southeastern part of the state. This connection ties Safe Harbor in with the entire 66-kv. network of the Pennsylvania Water & Power Company and makes power from both Safe Harbor and Holtwood available for the Pennsylvania Power & Light Company (Lancaster division), the Edison Light & Power Company at York and the Chester Valley Electric Company at Coatesville. It also makes possible the supply of Safe Harbor energy to the Metropolitan Edison Com-

pany over the interconnection recently put into service at York.

The southerly half of the Holtwood-Lancaster line from Lehman's Farm to Holtwood will become in effect a 66-kv. bus tying together the Holtwood and Safe Harbor plants. This completes the ring system of high-voltage transmission lines interconnecting Safe Harbor, Holtwood and the steam stations of the Consolidated Gas, Electric Light & Power Company of Baltimore.

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Ice Making Not Utility in Illinois

Holding that the business of making and selling ice is not that of a public utility within the meaning of the law and that ice companies, therefore, are not subject to its jurisdiction, the Illinois Commerce Commission recently dismissed a complaint of discrimination made against the Central Illinois Public Service Company. The commission says that it has never considered the ice business that of a public utility and doubts whether the Legislature could legally declare it such.

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San Diego Charter Unchanged

By 14,337 to 4,773 voters of San Diego, Calif., last month elected not to change franchise provisions, as they affect the San Diego Consolidated Gas & Electric Company. This means that there will be no irrevocable-franchise clause, but one providing, as now, for a revocable franchise on majority vote. The only change is that a 2 per cent franchise tax must now be paid on the gross annual receipts which accrue to the San Diego power company from the electric railway company. No effort was made by the San Diego Consolidated Gas & Electric to influence public opinion.

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Jersey Central Rate Reduction

T. R. Crumley, president Jersey Central Power & Light Company, has just announced as a company accomplishment in the final quarter of 1931 standardization throughout its territory of domestic and commercial rates involving a reduction of about $325,000 a year. This, he says, is the first economy to result from consolidation of the former Eastern New Jersey Power Company with the Jersey Central Power & Light Company and means that the room rate schedule in use in Jersey Central territory for two years has been extended into the new area served.

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Tillamook Project Up Again in Oregon

Representing a second attempt to create a people's public utilities district in Tillamook County, Oregon, under the provisions of the 1931 legislative act authorizing the formation of such projects, sixteen preliminary petitions have been filed with the Hydro-Electric Commission by groups organized in as many districts and incorporated towns throughout the county. By the terms of the petitions it is the purpose of the signers to issue bonds, appropriate water from Trask River, and develop hydro-electric power. If the commission finds the petitions to comply with the requirements, it will investigate the project and file a report relating to its feasibility within 30 days. If this be favorable, steps for a vote on the project can then be taken. The first attempt to form a Tillamook district was nullified on account of the petitioners' inability to frame the preliminary petitions properly.

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Sacramento's Double Project Beaten

At a recent special election at Sacramento, Calif., a proposal to float $12,600,000 in bonds to finance the construction of the Silver Creek water project failed by 717 votes to get the required two-thirds majority, a substantial gain in favor of the bonds over the vote cast in 1929, when the affirmative vote was 2,000 less. Prior to the election the Sacramento Municipal Utility District had reached an agreement with the Pacific Gas & Electric Company whereby the power company would lease the water to be impounded at the proposed Silver Creek dam and use it for the generation of power. The power company planned to erect a 30,000-hp. plant, to cost about $2,500,000. (ELECTRICAL WORLD, November 14, page 855.)

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Houston Adds Another Unit

The Houston (Tex.) Lighting & Power Company will complete and place in operation some time this month a 15,000-kw. turbo-generator at its Deepwater plant. In 1931 is placed in service a unit of about 35,000 kw. These two additions give a total of approximately 150,000 kw., at the Deepwater plant, besides a standby plant of 36,000 kw. in Houston. The system has grown from 295 miles of transmission lines in 1920 to 3,000 miles today.

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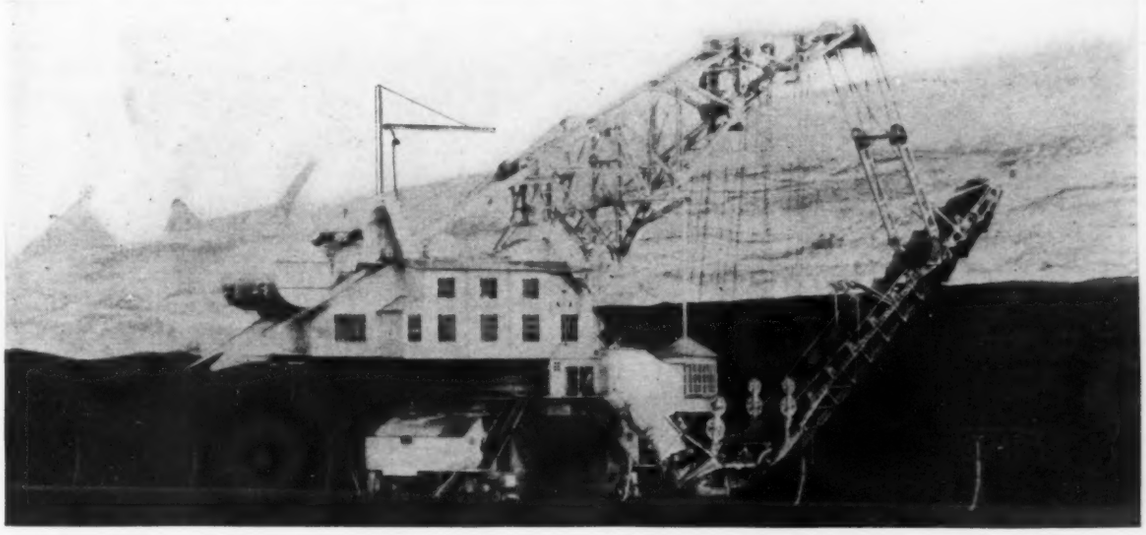
GERMANY STRIPS COAL ELECTRICALLY ON LARGE SCALE



Instead of following the bucket or shovel plan used extensively in our Illinois coal fields, Germany is using conveyor-type motor-operated excavators in her lignite fields. Performance is said to result in the removal of about 1,100 cu.yd. an hour.

EDITORIALS

L.W.W.MORROW
Editor

Lying back in the breeching?

"WHEN business revives, electrical manufacturers will be running around in circles trying to bring their organizations and plant facilities up to the required production level." This is not an exact quotation, but it expresses the sense of a statement made recently by one of the largest electric utility operators in the country. Undoubtedly there is truth in his comment. And just as undoubtedly there would be as much or more truth in the same observation made by a manufacturing executive about the electric utilities. Every man sees his neighbor's shortcomings before his own.

But there is less excuse for a utility to be caught napping in the face of rising demand than there is for a manufacturer. Of the two classes of business the latter is the more empirical; that is, to a greater degree than is the case with the utility, planning for future operations must be based on hopeful assumption rather than on actual data. Competition alone forces that. The utility knows its field of operation, has compiled thousands of sheets of load-development studies and, barring political and public relations obstacles, should be in position to know better than any other business undertaking where it is going in the next few years. Yet, do utility executives in general know, and are they planning adequately on, what their companies will do when business ceases to pluck feebly at the counterpane and begins to sit up and take nourishment? Impartial observation forces one to the conclusion that many do not and are not.

At least two—and there probably are many more—of the very large electric utilities in the United States have added new industrial business in 1931 at a rate greatly accelerated over 1930. Possibly the effect of adding this new business to the resurgence of loads of older customers when business rises has been taken into consideration in system planning. But one does not incline to that belief when he examines critically the mental state of the average utility executive. Firmly embedded in his brain is the conviction that his and all other systems are overbuilt in terms of generating, transmission and distribution capacity. For once in his experience, the utility man has this feeling in concentrated form and he is actually luxuriating in it. He had a slight touch of the disease in 1921, but did not have opportunity really to enjoy it before the rude voice of demand was heard commanding, "Here, get up out of this and get going!" He will hear that voice again, but he will find it harder to get up and get going this time unless he rouses himself from the coma into which he is allowing himself to drift.

Expensive information should be used—not filed

GREAT masses of information are continually being compiled by the electrical industry and its associations. Highly valuable information is made available and some of it costs large sums of money, yet those who pay for it often do not use it. They seem to prefer the costly trial-and-error method, perhaps on the theory that "our conditions are different." Maybe it is that human trait that makes each individual want to experiment and learn for himself; but whatever may be the motive, it is an expensive way of acquiring knowledge.

Take, for example, a utility that decides to embark upon a load-building program of some type —let us say water heating. What folly it is to ignore the great mass of information on rates,

systems and results that has been gathered from the field—to start from scratch and eventually arrive at the same conclusions reached by others who have experimented for ten years! A utility proceeding in this manner is doomed to make the same mistakes and learn the same lessons others made and learned years ago.

Great interest in water heating is sweeping the country at this time, and many utilities are planning to develop this class of business in large volume. The N.E.L.A. has just published its water-heating report, a report that cost the industry tens of thousands of dollars. It contains, in one of the finest and most comprehensive reports ever issued by the association, every bit of available field data on water heating. Between thirty and forty million calculations were necessary for its compilation.

It is a textbook and handbook all in one. It should be a bible for the utility man, yet how many have even read it, let alone studied it? It is not fiction. It contains concrete facts. If studied and assimilated, it will save large sums of money and much grief. Utilities paid for it; why shouldn't they make use of it to the fullest possible extent? Expensive information should be used—not filed.

Simplicity versus complexity in engineering

AT THE recent Atlanta meeting of the N.E.L.A. electrical apparatus committee, in a rather lively discussion on the subject of basic diagrams, the opinion was expressed that our life in general has become more complex, that engineering in general has become more complex, that power-system engineering particularly has become very complex and will continue to become more so, and that therefore we should be prepared for more complicated rather than for simpler basic diagrams.

While it is true that life in general and engineering in particular have become very complex, it is equally true and very significant that engineering fundamentals have become greatly simplified and classified. Even in art and decoration we have broken away from complicated basic designs and are building up our modern decorative schemes from simple straight-line fundamentals. Modern architecture has got rid of all the old "gingerbread," and the majesty of the modern skyscraper is expressed by its simple straight lines and the very few simple basic elements of which it is built up. The modern steel structure is composed of simple H-beams instead of box beams or similarly built-up members, and electric welding will soon eliminate numerous complicated joint details.

It would seem that the more complex an engineering structure becomes the simpler become the elements of which it consists and the fewer the types. Even though power systems are becoming more complex, therefore, there is no good reason why the attempt should not be made to reduce the number of basic elements to a minimum—to find out what is "gingerbread" in these elements and then proceed with its elimination.

The most important factor in local trade relations

NO ONE can question the sincerity of the effort that is now being made by the power industry to establish a basis of frank and friendly co-operation with the dealers of all classes who sell domestic appliances. The joint committee in which the N.E.L.A. is working with the national associations of the hardware and department stores has been studying the background causes of the recent legislation against public utility merchandising. In many states the dealers and the power company men are being brought together to settle points in controversy. Out of it will come a closer understanding and the gradual abandonment of those competitive practices in central-station selling that have been the chief sources of the trouble.

Chief among these irritants is the commission basis of compensation for power-company salesmen. For inevitably it throws these men into vigorous personal competition with every dealer, and they take advantage of their more favorable position in a dozen different ways. The rules of the company may be entirely fair to the independent dealer, but by suggestion and by inference the company's representative can make the customer feel that he will be connected quicker, or obtain better terms on the purchase, or be safer in some other way, if he buys from the utility. The salesman is ingenious in the use of this influence, but

the customer is continually giving him away. It forms an insidious barrier to dealer sales that naturally exasperates the competing retailer and drives him to retaliation.

It seems to be impossible to insure fair dealing and maintain the good will of the local trade so long as power-company appliance salesmen are dependent for their income upon commissions on the sales. But if they are on salary and can earn a bonus on growth of domestic load by whomever connected, then automatically it becomes to their interest to encourage the dealers to sell load-building appliances, and they become co-operative. Here is probably the most important single factor in local trade relations.

Ice for air conditioning

MORE money in it for the electric utility. So claim the proponents of ice for air conditioning as opposed to mechanical refrigeration in the same job. They point out that the central station sells 55 kw.-hr. per ton of ice manufactured and then sells 30 kw.-hr. more for melting the same ton of ice in air conditioning. They point out that an ice installation requires no capacity enlargement or revision of service arrangements such as are so often necessary when the load of a single large motor must be taken on in an area where lighting service is the paramount consideration; they point out that because the customer's investment in air conditioning is much less with ice than with mechanical means the field of application will be widened, with consequently greater and more diversified load on the utility system, and they point out that the central station will retain and increase its ice-making load if the ice manufacturer can be convinced that the utility will go along with him in the development of this new field.

These appear to be pretty good reasons why the central-station man should remember that ice is a perfectly practical means for air conditioning and why he should interest himself in that aspect of the subject. Air conditioning is not yet so widely understood and appreciated as a central-station load as it will be a few years from now. And there is more information on its mechanical phase available to the power salesman than there is on the possible use of ice. But the ice industry is busily collecting data, designing equipment and rallying its forces for the invasion of the new field. In this preparation the electric utility industry has a beautiful opportunity to demonstrate a friendliness and an interest that should do much to soothe the injured feelings of the ice manufacturers resulting from the exploitation of domestic electrical refrigeration.

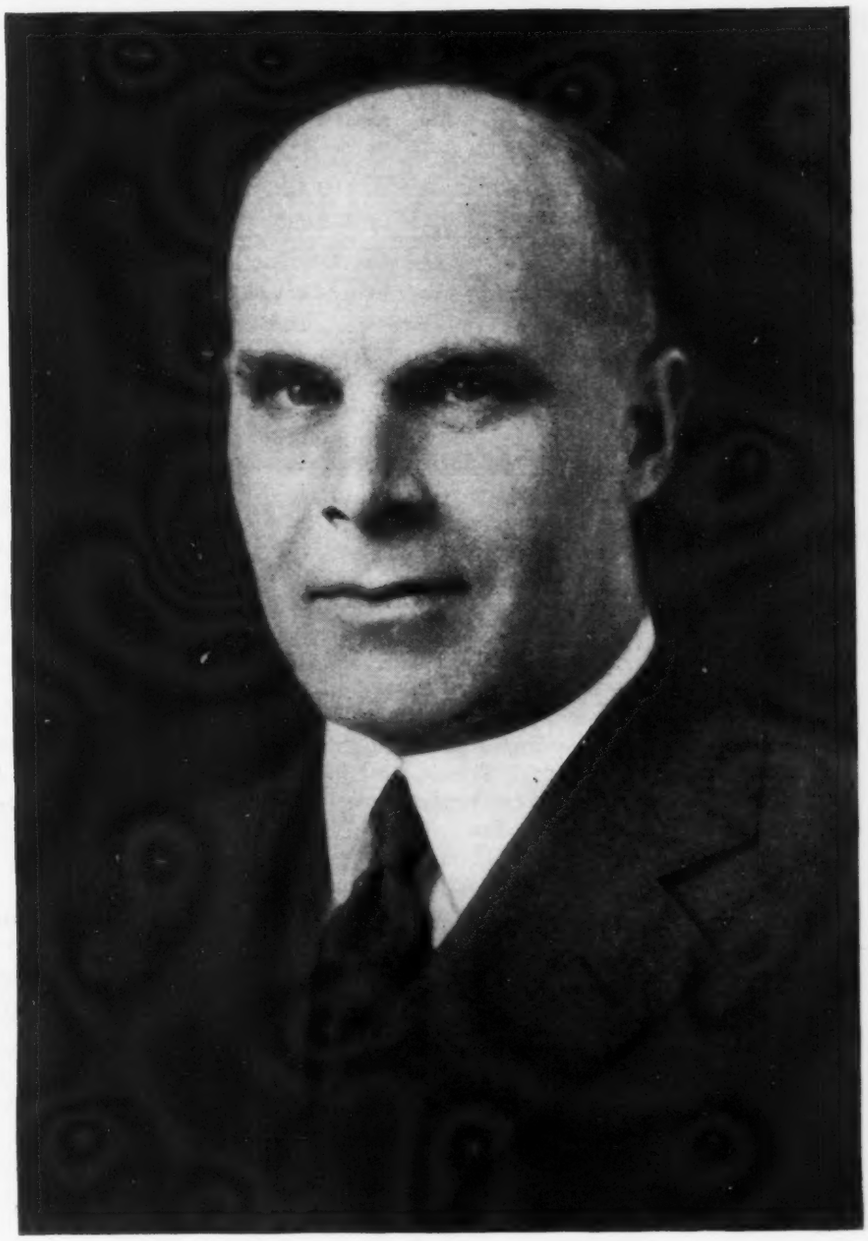
Uniformity more important than constancy of furnace temperature

FACTORS conducive to uniformity of temperature throughout electrically heated furnaces and ovens are generally acknowledged to have a strong theoretical foundation. Published test data, however, have been too scarce to convert tacit acceptance into a working gospel. Fuel-fired furnace users are prone to be lulled into a feeling of secure salvation if they receive daily charts showing a virtually straight line of temperature from pyrometers installed at what are assumed to be the most indicative locations. The user is prone to overlook the fact that thermostatic control is likely to be actuated by the very indication which is then taken as an index of performance of the furnace, whereas it may well be little more than a monitor on the functioning of the control.

Fussy jobs of annealing, heat treating and baking depend for their effective accomplishment more on the uniformity of temperature all over the working area than they do upon reliance on deceptive constancy of temperature at a single spot or at a limited number of spots. Right here the electrically heated furnace has the superiority because of the ease with which the heat sources can be distributed to produce a uniform temperature régime. Moreover, once established, the absence of turbulence and forced convection of the heated atmosphere is conducive to minimum differences in temperature from point to point.

Those who have assumed these differences in well-designed fuel-fired furnaces to be small may be shocked to learn that they are often large—200 or 100 degrees F.—and only with great pains brought down toward 25 degrees F. In a properly designed electric furnace these differences can easily be made 10 degrees F. or less. Exhaustive tests have recently proved both statements.

Charles Wetmore Kellogg



NEXT to Muscle Shoals, Conowingo is possibly the most familiar name in the nation designating a hydro-electric plant. It is a household word in Pennsylvania and Maryland, it is scarcely less well known in New York and New Jersey, and it is very far from meaningless in any state where water power is a topic. To have been a chief factor in working out this great project would be an important enough feather in any man's cap to stand alone. But it is only one of the feathers that adorn the cap of Charles W. Kellogg, president Engineers' Public Service Company and since 1903 affiliated with Stone & Webster interests.

Previous accomplishments of his for that firm included the management of the Edison Electric Illuminating Company of Brockton, Mass., 1904; the El Paso Electric Railway Company of El Paso, Tex., 1905; the Eastern Texas Electric Company of Beaumont, Tex., 1911, and the Mississippi River Power Company (Keokuk Dam), 1914 to 1920. An outstanding achievement was his management in 1919 and thereafter for Stone & Webster of the report and appraisal of the New York Railways Company and Interborough Rapid Transit Company of New York City. Then came the Conowingo enterprise, undertaken by Stone & Webster for the Philadelphia Electric Company.

In September, 1925, Mr. Kellogg assumed his present position as president of the Engineers' Public Service Company. He is also a director of many of the constituent companies, including the Virginia Electric & Power and the Puget Sound Power & Light. He has been connected with the General Public Service Corporation as president and later as chairman of the board since its formation in 1925. Mr. Kellogg was born in 1880 at Philadelphia. Receiving his earlier education at Brookline, Mass., to which his family removed, he continued his studies along engineering lines, receiving two degrees in electrical engineering from the Massachusetts Institute of Technology, S.B. in 1902 and M.S. in 1903.

This Air-Conditioning Business

By W. J. KYLE

Byllesby Engineering & Management Corporation, Chicago, Ill.

Adapted from an informational and advisory letter to operating companies in the Byllesby group, this article discusses air conditioning from the standpoint of what the power salesman should know about electric service application in this developing field

AIR conditioning requires consideration of five major factors, cleanliness, relative humidity, temperature, volume and velocity. With technical propriety any equipment or device that deals with any one or more of these factors can be classified as an air-conditioning means, because actually it does affect the air condition. But practically speaking, the term "air conditioning" has acquired a specialized meaning which does not admit fewer than all of the above-named factors into its definition. For instance, temperature control alone is not air conditioning. Neither is humidity control, nor air washing, nor velocity and volume supervision. Air conditioning is all of these things, not just one or some of them. This distinction is made because the single purpose equipments are being marketed under the generic classification and it is easy for the uninformed customer to be given the impression that he is getting an air-conditioning job when actually some smart salesman has sold him an air washer alone.

Residential air conditioning

There is nothing on the market today to do a complete job of air conditioning in the home. It is possible, however, to obtain unit type equipment that may be installed in a residence to take care of single rooms, but a difficulty with all this class of equipment is in the cooling medium used. There has been some attempt to use water for this purpose, but this means in most cases that the water itself must be cooled before it can cool the air. In order to reduce the humidity the air must be brought to a temperature point in the conditioning process lower than the required comfort temperature. The problem in the development of home air-conditioning equipment is to design on a small scale an apparatus that will do a satisfactory dehumidifying job. The principal trouble with the small equipment now on the market is the fact that the cooling medium is carried through a radiator in which the air is circulated. The idea is that the air temperature will decrease and the moisture will drop out. This can be done if the temperature of the cooling medium is low enough, but in most cases it is impracticable to incorporate sufficient radiating surface within the necessarily small dimensions of the device. The present difficulty seems to lie in the fact that engineers working on this development are unwilling to compromise their search for the ideal. If air-conditioning equipment for home use is going to be developed this compromise will have to be admitted.

Air conditioning as applied in commercial and industrial installations is an accomplished fact, although the business has not been developed to a high degree. Perhaps the highest development so far has been reached in motion-picture theaters. Some very serious mistakes have been made in the proper selection of equipment for this use, mistakes that have resulted from competition of manufacturers for the business and ignorance on the part of the purchaser.

A great many of the systems that have been placed in motion-picture theaters should be classed simply as cooling and ventilating and not air-conditioning systems. All sorts of makeshift equipment and devices have been sold and installed under the label of air conditioning, with the result that customers have not been entirely satisfied. Also, temperatures far below proper requirements have been maintained in these installations, with the result that the theater patron, especially when he leaves the theater, experiences a feeling of discomfort that makes him hesitate to repeat the experience. In this class of air conditioning it requires considerable technical skill to lay out a satisfactory job because the factors are so variable and every one of them must have careful consideration. Therefore in jobs of this kind it is recommended that the power salesman seek the most competent engineering advice and skill that is available to him.

There is a large air-conditioning business awaiting the electric utilities in restaurants, hotels, public auditoriums, office buildings, department stores, theaters and all places where the public congregates. There is a lot of business also in industries such as cotton, silk and wool manufacturing, baking, leather processing, printing and lithographing plants, candy manufacturing, tobacco plants, enameling processes, paper manufacturing and a host of others.

Ice for air conditioning

Ice as a means of cooling has already been used in a number of air-conditioning installations and this method will probably grow very rapidly. In some of these installations the air is passed through an ice bunker and then carried through the equipment to the rooms

to be cooled. The disadvantage of this method is the fact that practically no washing effect is obtained. Also the cooling is not sufficiently rapid and the moisture content is retained in the air. Another method that is developing includes lowering the temperature of water by means of ice and then pumping the cooled water through spray nozzles, permitting a very rapid absorption of heat by the water. This method accomplishes the purpose of dehumidifying and washing very effectively. Of course extreme low temperatures cannot be obtained in this process, but exceptionally low temperatures are unnecessary except in special industrial cases. Therefore it appears that this method of approaching average air conditioning could eventually be worked out in a satisfactory manner. This method has sometimes been described as a makeshift, but judging from the results that have been obtained from systems properly laid out this is not true. The method has considerable merit and the criticisms of it come largely from those seeking what might be described as an ideal engineering job without regard to consideration of investment and operating costs.

There is another aspect of the use of ice in air-conditioning installations which the electric utilities should not lose sight of. It promises an extensive market for the manufacturers of artificial ice, since it is quite obvious that the method, if properly worked out, has the merit of lower investment and low operating costs to the user.

Dry ice has also been used in place of artificial ice in air conditioning, but as far as is now known the cost is prohibitory under any except very favorable circumstances.

Air conditioning and the heating system

In the last few years some furnace manufacturers have advertised air conditioning in connection with hot-air furnace installations. The main object of this publicity effort of course is to combat steam and hot water heating. Such equipment offered to customers should be very carefully examined in order to discover if the advertiser is not talking only of air humidifying and circulation and not of complete air conditioning. However, with the hot air system of heating it is entirely practicable to add the necessary equipment for dehumidifying the air and using the hot air duct as the means for conveying the conditioned air to various parts of the building. But at best this would be only an expedient and the greatest field for the combination of the hot-air furnace and the air-conditioning plant must lie in the construction of new buildings. At the present time the hot-air furnace manufacturers do not seem to be sufficiently informed on what air conditioning means, and the engineering approach to the job. Neither do they appear to appreciate the commercial advantage of increased business that would follow the combination of the two functions.

Silica-gel is a highly hygroscopic material which has the same chemical analysis as sand but differs from it in that the granules are not dense but are extremely porous. Thus silica-gel is a moisture absorber of great capacity. The process of air conditioning using this material consists in the passage of the incoming air through a bed of silica-gel in which a large part of the moisture in the air is absorbed. The air is then passed over water-cooled coils and discharged for use. The advantage of this method is that it is not necessary to reduce the temperature of the air to the dew-point at which the moisture will separate. It is necessary only to reduce the air temperature to that point which is proper for comfort. The accumulated moisture in the silica-gel is disposed of by heating the gel periodically after it has been removed from the system. This necessity requires shutting down the system while the gel is being dried out, or the use of multiple batches so that a dry batch may be put into the system when a wet one is taken out.

Silica-gel may be the answer to the difficulty of dehumidification, which is the greatest obstacle in the way of wide application of air conditioning. But it should be borne in mind that this method is yet only in the stages of development, while the mechanical method has already been worked out and good commercial results can be obtained from it.

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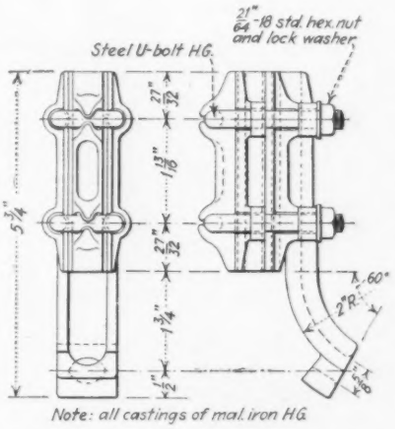
Grounding Clamp Take-off Provides Smooth Path to Earth

By H. V. INGERSOLL

Stone & Webster Engineering Corporation, Boston



Detail of take-off ground clamp

In the design of the new Petersburg-Roanoke Rapids 110-kv., H-frame wood-pole transmission line of the Virginia Electric & Power Company particular attention was given to the use of the wood insulation of the structures as an added protection against lightning flashovers. It was decided to connect the two overhead ground wires to earth at each structure in such a manner as to utilize at least 5 ft. of the poles above and below the crossarm as insulation. The earthing wire was, therefore, attached to the overhead ground wire approximately 10 ft. away from the structure and brought down to the pole some distance below the crossarm.

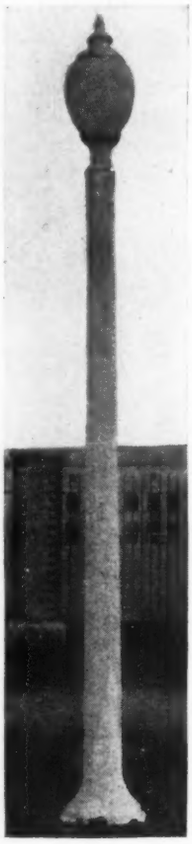
In previous designs of this type it was necessary to make a wrapped joint at the end of the clamp attaching the earthing wire to the ground wire in order that the earthing wire could leave the clamp at the angle desired with no sharp change in direction.

The new clamp developed, as shown in the accompanying drawing, provides a throat which allows the wire to leave the clamp with no sharp change in direction. The two U-bolts which clamp the two wires together make a tight, positive connection. The use of this clamp saved considerable time in making the earthing wire connections and proved very satisfactory.

Concrete Posts with Special Adapters Designed for Boston

Hollow concrete posts are gradually coming into wider service for street lighting in parkways and high-class residential areas served by the Edison Electric Illuminating Company of Boston. Some of these shafts are spun, in which case a smooth interior surface is secured during the turning process on account of the shifting of the heavier stones in the concrete outward by the centrifugal force. In such cases it is not necessary to insert a metal lining to provide a smooth passage for connections. These shafts are terminated at the top with a threaded collar for connecting the lighting unit. In other types of precast concrete shafts the interior surface is lined with a metal sleeve which terminates at a threaded top.

The lighting standards adopted by the Boston company include a 12-ft. shaft equipped with a 600-cp. "Novalux" unit and a 15-ft. post which supports a 1,500-cp. unit of similar type. The smaller unit is used in residential and side streets and the larger one is installed in the main traffic arteries.

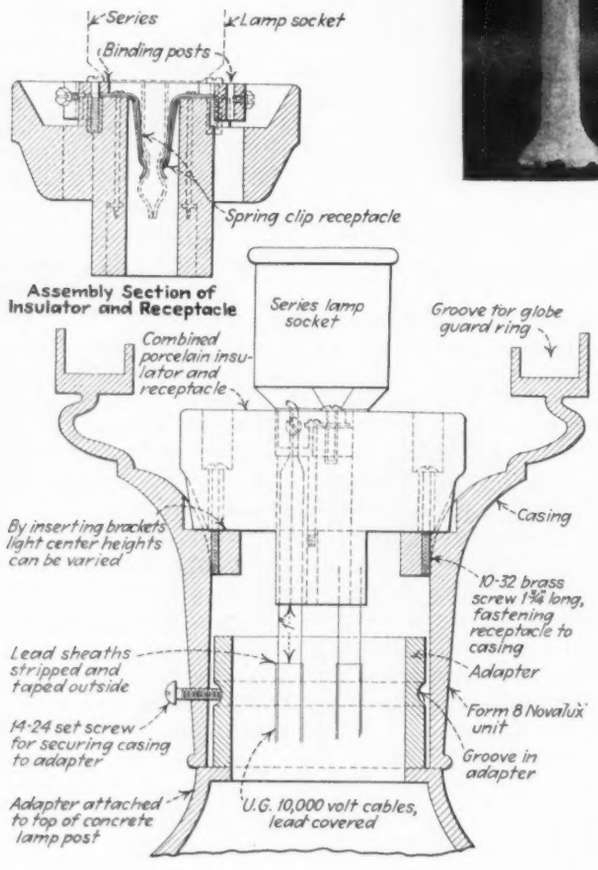


Hollow-spun concrete shaft opposite Harvard Stadium

A view of the 12-ft shaft shows a type of slip-on adapter at the top of the post, designed by the Edison company for connecting the base of the lighting unit to the post. This design avoids the bulging effect typical in the conventional type of fitting and which interrupts the gradual taper in these standards. The method of connecting a Form 8 "Novalux" 600-cp. unit to the top of the 12-ft. shaft is shown in the drawing of the adapter, insulator and connecting structure. A wet process porcelain insulator safeguards against contact between any part of the shaft and the stripped portions of the 10,000-volt cables as well as to live parts of the lamp socket. The spring-clip receptacle provides an automatic by-pass when the socket is pulled out.

The assembled standard and lighting unit thus combine beauty of appearance and safety from breakdowns due to short circuits or grounds with convenience for maintenance. The installation of concrete shaft-lighting units is divided between the street engineering department, which sets the poles in place, and the street lamp division, which installs the lights and completes the connections

Slip-on adapter and insulated connecting structure


Series
Lamp socket
Binding posts
Spring clip receptacle
Assembly Section of Insulator and Receptacle
Series lamp socket
Groove for globe guard ring
Combined porcelain insulator and receptacle
By inserting brackets light center heights can be varied
Casing
10-32 brass screw 1¾" long, fastening receptacle to casing
Lead sheaths stripped and taped outside
Adapter
14-24 set screw for securing casing to adapter
Form 8 Novalux unit
Groove in adapter
Adapter attached to top of concrete lamp post
U.G. 10,000 volt cables, lead covered

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Transmission-Line Maintenance Experience and Cost

By J. H. NICHOLS
New York Power & Light Corporation

To reduce the rate of depreciation on some of the older tower lines due to rust and corrosive action one company has adopted a policy of yearly inspection to ascertain when painting will be necessary. Initial inspection of all tower lines in operation over ten years was facilitated by the aid of a good stiff steel brush and putty knife to check the depth of rust or corrosion pits and rust at tower footings.

It has been found that towers standing ten years which were originally painted towers would not require painting until about the fifteenth year, except where located in industrial areas, along railroads, through marshlands or along rivers.

On painted towers the greatest depth of pits was found where the lines ran through marshlands affected with rising fogs. The greatest amount of rusting at footings was found at towers situated along the right-of-way between forests where the footings are shaded from the sun for the greater part of the day.

One galvanized tower line running through practically all types of land and standing twelve years was slightly discolored for a great portion of the line, but there were no signs of pits on the members. The discoloration came from the threaded portion of connecting bolts and ran down the tower during rains. At railroad crossings and on a portion of a line paralleling and between a railroad and river towers were found to be uniformly rusted to such an extent that it was deemed necessary to paint them before rust pits could start. At the rail-

road crossings the towers were unaffected up to a point about 30 ft. above ground, but above this elevation the same uniform rusting was found. Other tower lines with larger cross-members were found to be free from rust, mainly due to improvements in galvanizing.

Tower painting "Work Orders" are grouped according to a route acceptable to the system operator. Release from the system operator is required only while painting arms and portion of towers adjacent to a circuit. The schedule for painting tower tops is to brush and red-lead the side and arms adjacent to the released circuit of about ten towers (grounds installed at first and tenth tower), obtain a release of the other circuit and do the same. By this time the first side painted is dry and ready for application of the carbon black. This procedure has been adopted to keep one circuit in operation.

As a general rule the area to be painted has been proportional to the weight of the towers. Information from the paint dealer gave the approximate area the paint would cover and time required to apply it. An inventory made from the foreman's daily reports of amount of paint used, number of towers painted per day, labor cost, tools, trucking and overhead gave the costs shown in the accompanying table. This may be used in planning future tower-painting schedules.

Cost of Painting Transmission Tower

Line No.	Average Tower Weights (Lb.)	Number Towers Painted	Days to Paint	Number Circuits on Tower	Days Lost (Releases Rain, Etc.)	Material Labor, Truck Overhead
1	6,500	22	23	2	..	$1,407.00
2	7,900	27	32	2	1	1,957.00
3	7,900	24	38	2	10	2,384.00
4	3,500	21	10	1	1	874.88
5	4,800	28	23	1	1	1,450.00
6	4,800	50	30	1	1	2,380.00
		172	156		14	$10,452.88

Rate of Paying Paint Crew	
Foreman	$7.75
Chauffeur	5.50
Painters (5)	30.00
Ford truck	6.75
	$50.00

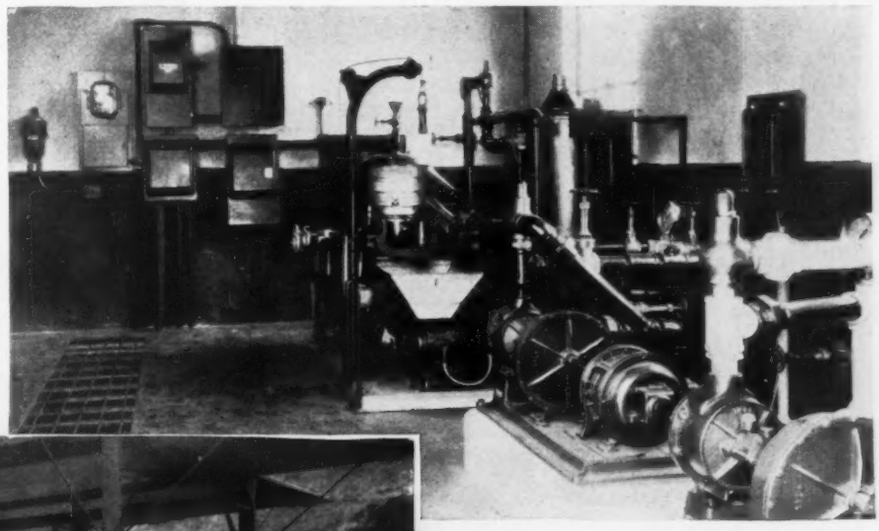
Line	Towers	Cost per Tower, Deducting Lost Time Cost Each
1	22	$63.90
2	27	70.62
3	24	78.50
4	21	39.28
5	28	50.00
6	50	46.60
	172	$56.70

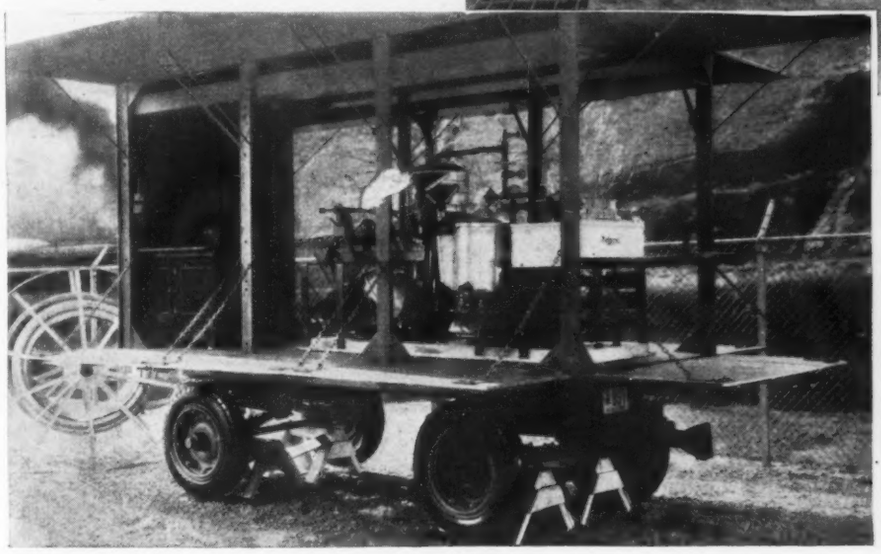
▼ ▼ ▼

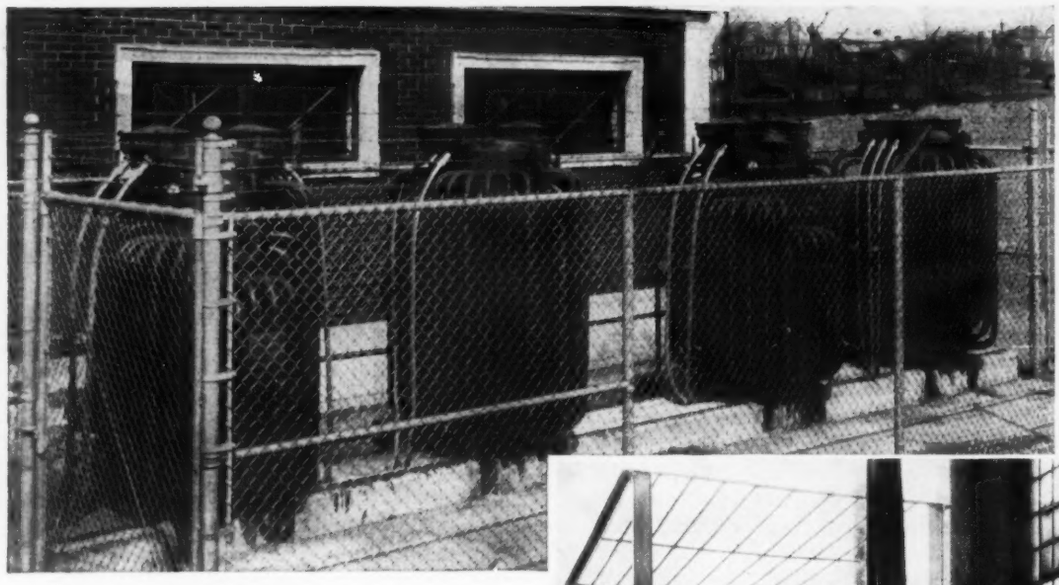
Oil-Purifying Systems for Large or Small Substations

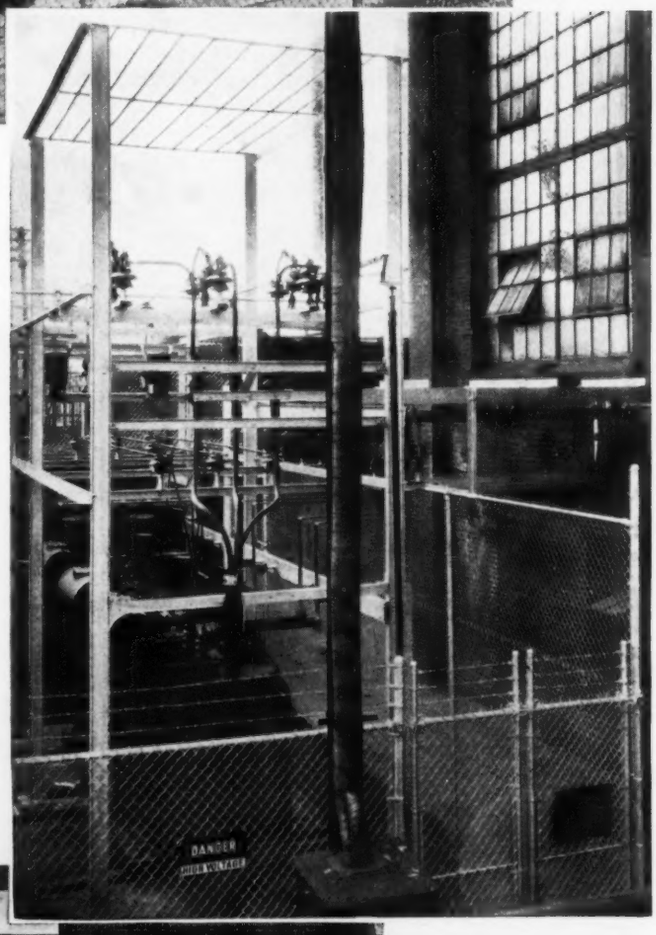
Oil-handling facilities are provided for all of the major substations of the American Gas & Electric Company system. The type of system employed depends upon the importance of the station, the quantity of oil stored in the apparatus and the closeness of other stations having oil-handling facilities. At the smaller substations a portable purifying outfit, consisting essentially of a centrifuge and filter press mounted on a truck or trailer, is used. At some of the smaller isolated stations permanent oil-storage tanks are used in conjunction with the portable equipment.

At the larger substations, where more than 15,000 gal. of oil is contained in the transformers and oil circuit breakers, a permanent installation is generally employed. A room is usually provided in the substation building to house the purifying equipment, and two pipe lines are used between the apparatus in the switchyard and the oil-purifying room, one for carrying clean oil and one for dirty oil. The apparatus is connected to these pipes through flexible hose, which is coupled to stand pipes distributed at various strategic points in the yard. Clean and dirty oil tanks facilitate rapid replacement of oil and permit purification of the stored dirty oil when convenient.









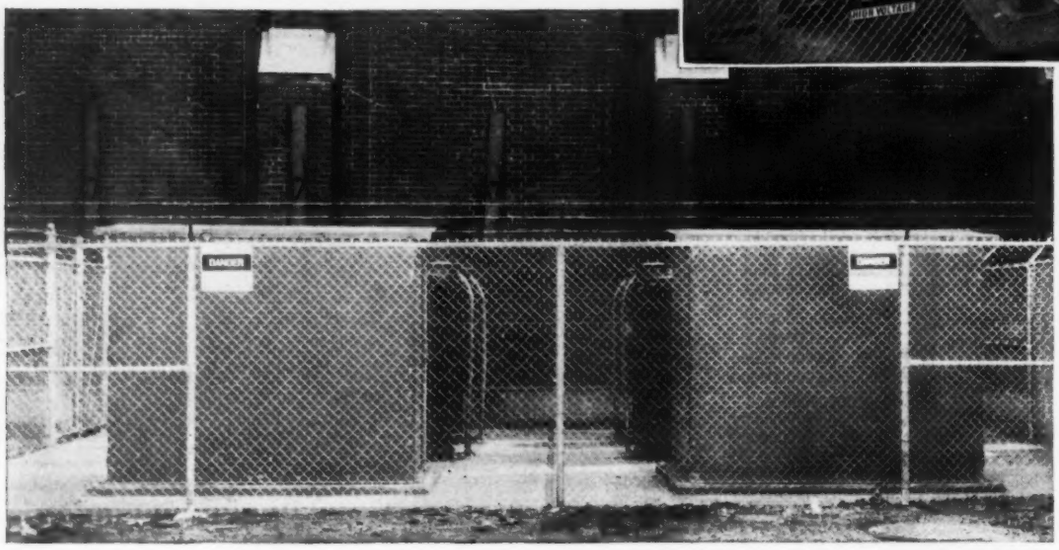
Versatility in Customer Substations

Thirteen-kilovolt substations have to meet a variety of requirements as to space, layout and economy between the extremes of temporary power supply and the power service in high-grade residential and institutional surroundings.

Top—2,000 kva. of 13.2/2.3-kv. transformers on rails with cables carried in ducts in the concrete below the rails. Transformers supplied from two lines. Secondary (2.3-kv.) cables supply both customer and adjacent distribution load.

Center—Industrial load of 1,000 kva. at 550 volts supplied from 13-kv. cable line. Fuses and metering transformers at far end, air break switch and supply cable at near end.

Below—Supply to Philadelphia hospital from the 13.2-kv. transformer banks fed by different lines. Steel switch cabinets make trim installation. Cabinets contain cable potheads, disconnect switches and fuses.



Future Cost of Power

By A. G. CHRISTIE
Professor of Mechanical Engineering, Johns Hopkins University

- Increased load factor offers greatest possibilities.
- Fixed and operating charges about at minimum.*
- Some savings in interconnection and base-load station.
- Little economy in outdoor power plants.
- Cleaning of flue gases costly.
- Average hydro power will not reduce costs.
- Increase of underground service delays rate reductions.
- Standardization and simplification of organizations will reduce overhead.

STEAM power plants can be built today for given steam pressures at a lower total cost than for many years. The actual investment that may be justified in such plant depends upon the cost of fuel and the annual use factor of the system; the higher these two items, the greater may be the cost of plant. In general, with $5 coal and 40 per cent annual load factor, station costs will now range from $75 to $80 per kilowatt of capacity, as against $100 per kilowatt ten years ago. In a plant of 100,000 kw. capacity this represents a decrease of at least $2,000,000 in investment and, with fixed charges of 14 per cent per year, a saving of at least $280,000 per year. With 40 per cent annual load factor this represents an average minimum decrease in cost of 0.8 mill per kilowatt-hour. As rates are now set up, this would result in a reduction of rates to the large power consumer of about 0.5 mill, while the rate to the domestic consumer who uses 400 kw.-hr. per year per installed kilowatt could be reduced about 6.5 mill due to the large share of his cost, which is fixed by demand charge.

The possibilities of further reductions of investment in plant and distribution system per kilowatt of capacity form interesting speculations. The cost of central stations will fall below present figures only if larger turbines and boilers than at present are used and if a simplified unit design can be developed, with such an arrangement as a one-boiler one-turbine unit. The trend appears to be in this direction. With such plant huge condensers and enormous supplies of proper cooling water are necessary. Hence river, lake or bay sites will be needed for such plants.

Outdoor power plants

There is considerable talk about outdoor power plants. This is already an accomplished fact with certain central-station electrical equipment. In many cases the complete switching plant has been placed out of doors at a lower cost than when housed. Certain hydro-electric plant has been built with the hydraulic turbines and generators lacking the usual plant inclosures. These units are protected from the weather by suitable sheet-metal framed covers. Such plants are said to operate satisfactorily.

When one considers the possibilities of a steam boiler and turbine central station built in the open certain operating difficulties present themselves. Climatic conditions, the necessity of periodical opening of machines for repairs and inspection under all conditions of weather and the exposure of the necessary operating and repair forces to severe temperature changes present substantial objections to the outdoor station. In any case the massive foundations for boilers, turbines and condensers, the intake and discharge water tunnels, the structural steelwork to support the boilers and their auxiliaries and to carry the turbine room crane, and the necessary space for laboratories, control rooms, repair shops, dressing rooms and executive offices, all form a substantial portion of the present cost of a power station. Coal storage is already placed outside some of the newer stations. The saving from omitting the remaining parts of the present superstructure would not be large in dollars per kilowatt of capacity and would be offset by increased costs of operation and maintenance. The outdoor central station, at least in Northern localities, appears to have no economic justification, and one need not look for reduced power costs from such a source.

Social demands and taxes

Engineers have made substantial reductions in the cost of power plants during the last ten years. It is becoming evident that these reductions may be offset in the future by certain social demands that may be made upon the utilities. All will agree that pure air and a clean atmosphere are highly desirable in every city. To attain these conditions the flue gases from coal-burning stations would have to be washed and otherwise purified before being discharged from the chimneys. Such cleaning of flue gases appears to require quite elaborate plant and expensive construction, the costs of which may offset any further cost reductions in other portions of the plant. Consumers will have to pay in their rates the charges on these purification systems, which charges will lessen the chances of lower power costs.

**Abstract of paper presented before the Baltimore section, A.S.M.E.*

There is the further element of taxes. Lawmakers find that the electric utilities are easily taxable because these taxes are readily passed on to the consumers in these taxes are readily passed on to the consumers in increased in late years in a greater ratio than load, and if this rate continues taxes will tend to prevent further reductions in power prices. This method of indirect taxation is unfair for electrical service is now a generally used public utility, the more extended use of which by all citizens should be encouraged. However, when taxes are passed along to the consumer in his rates, the more progressive user who consumes the greatest amount of power is taxed heaviest. This discrimination is obviously unfair.

Water power

Some one will ask, "Can water power reduce costs?" When power can be secured from hydro-electric plants on large rivers with constant flow, such as the Niagara or the St. Lawrence, or where flows can be controlled from low-cost storage, cheap water power is a possibility. When plants are located upon variable flow rivers, which is the usual case on the Eastern Seaboard, additional capacity must be installed in steam plants to carry the load in low-water periods. The added fixed charges on the steam plant and its cost of operation increase the cost of water power in such cases. Large hydro-electric plants, to use variable run-of-river, are generally warranted only when a large power system can absorb into its normally steam-supplied load all the power that may be developed at all stages of river flow. Hydro-electric energy will not therefore in the average case necessarily tend to lower the cost of power to any great extent.

Interconnection

Interconnection of large systems enables the various companies to carry less stand-by plant as dependence can be placed on the interconnected company for help in an emergency. This lessens plant investment and thus lowers power costs. Hence interconnection forms a desirable means of lowering power costs. The various systems in this country are being interconnected as fast as can be equitably and economically arranged.

Reduced costs of distribution systems may be achieved through standardization on a single frequency, through wider use of high-tension feeders and through the employment of standardized house installations. Here again the public demand for underground distribution imposes an added burden upon the utility which offsets some of the above savings.

Load curves and load factors

Fixed charges are a constant sum for the year regardless of output. The greater the number of kilowatt-hours over which these charges are to be distributed the lower will be the unit proportion of fixed charges. Obviously for a given plant and investment, this element in the cost of power will decrease as output increases. The problem is to increase consumption of kilowatt-hours without requiring additional plant to serve this demand. Hence consideration must be given to maximum kilowatt-hour production from a given plant.

The daily output of a station is generally shown on a load curve which indicates the extent of load at any time during the day. The simultaneous occurrence of demands for energy at 5 p.m. for lighting, commercial power, domestic services and street railway have developed the daily peak. From midnight until morning there is little demand for power. Increased output from the present plant could be secured by filling in the hollows in the load curve. Load distribution changes from day to day, so this curve does not give complete information of the yearly system load. A more complete graph of conditions shows the load duration curve for a full year. Each point on this curve indicates the total hours that the load has not been less than the amount indicated by that point. The area under the curve is proportional to the total kilowatt-hours generated. The ratio of this output to the product of the annual peak and 8,760 (the total hours per year) gives the annual load factor.

Analyses made possible by load factor

Some interesting deductions may be drawn from a study of the load-duration curve for a station with a peak load of 200,000 kw. Calculations indicate that the annual load factor for the whole station is 51.4 per cent. Let us assume that a certain portion of the plant with 40,000 kw. capacity is used only to carry the upper 20 per cent of the peak load, which lasts for about 300 hours per year. The annual load factor for this portion of the plant is only 1.7 per cent. Let us further assume that this plant cost $90 per kilowatt to install, that fixed charges are 14 per cent per year, that coal costing $4 per ton of 2,000 lb. and of 13,200 B.t.u. per pound heating value is used, and that the station heat rate can be represented by the formula

$$\left(13{,}600 + \frac{100{,}000}{\text{Annual load factor in per cent}}\right) \text{B.t.u. per}$$

kilowatt-hour. If this peak load plant of 40,000 kw. is only operated and on stand-by for three months during the Christmas load, its load factor for that period would be equivalent to an annual load factor of 6.8 per cent. The cost per kilowatt-hour delivered on this peak load after allowance for labor and maintenance will be 9.04 cents, which is a high generating cost, and which must be absorbed by the remaining load of the system. Similar assumptions for the extreme peak of 20,000 kw., and assuming this plant to be on stand-by and ready for service for only two months in the year, leads to a cost of 12.62 cents per kilowatt-hour. Actual production costs would probably exceed this figure.

The annual load factor for that portion of the load below 160,000 kw. is 63.8 per cent. If the same unit cost of station, rate of fixed charges, fuel costs, heat rate and labor and maintenance allowances are made for this portion of the plant as for the peak portion, the cost per kilowatt-hour becomes 0.522 cent.

Finally, if it were possible to operate the whole plant on a 100 per cent load factor it would be possible to generate power for about 0.44 cent per kilowatt-hour. The average cost of power of the whole plant of 200,000 kw. capacity at the existing annual load factor of 51.4 with the same assumptions as before figures 0.58 cent per kilowatt-hour. Thus a decrease of 10 per cent in the cost of power can be achieved if the annual load factor can be built up from 51.4 to 63.8 per cent and a 24 per cent decrease in cost if 100 per cent load factor could be secured. This further demonstrates that

increased load factor is one of the most important elements in reducing power costs.

How can annual load factor be increased? This involves building up the daily load curve and eliminating the seasonal fluctuations in demand. Daily load factors can be increased by increasing night loads through the use of power in certain intermittent electrochemical processes, by encouraging the night operation of factories through inducement rates, and by developing the use of off-peak power for commercial uses. Peaks can be kept at a fixed amount by adding interruptible power loads at an attractive rate. These loads can be dropped if the peak exceeds a given amount. Such interruptible load is thus, in essence, added off-peak load. With favorable rates, it is possible to increase substantially this interruptible load on most power systems.

The load factor of domestic service can be improved through the more widespread use of labor-saving devices and conveniences such as washing machines, ironing machines, humidifying apparatus, dishwashers, refrigerators, vacuum cleaners, cooking ranges and radios. The diversity in the use of this equipment causes consumption of power at other periods than the normal lighting peak and this greatly improves the average load factor not only of the domestic consumer but of the system as a whole.

From this discussion it would appear that the hope of the domestic customer for lower rates lies in greater use of his present consuming devices and in the addition to his home of further electrical equipment to provide diversified load. An aggressive sales campaign of household equipment on the part of the utilities would appear to be warranted as a means of load building and also to reduce power costs to all users. This is further indicated by the fact that, during the depression, the domestic loads have been well maintained and have been the main source of the utilities' revenue. The commercial power loads, which are often served on a narrow margin of profit, have slumped badly and have shown poor earning capacity under present conditions. Hence the future field for power development should be the constant domestic load rather than the variable commercial power loads.

Operating costs

Attention has been called to the effect of increased load factors in lowering fixed charges. Fuel costs will decrease only slightly with increased load factors. For instance, for a plant of the assumed performance discussed previously fuel cost will decrease 1.13 per cent for an increase of annual load factor from 51.4 to 100 per cent. Labor costs per kilowatt-hour tend to decrease with increased load factor, but not in the same proportion to the decrease in fuel costs. Maintenance costs per kilowatt-hour decrease even less than labor costs with increased load factors. Coal consumption per kilowatt-hour in the newer central stations ranges from 1 to 1¼ lb. per kilowatt-hour. With $4 coal and 1 lb. per kilowatt-hour the total fuel cost is only 0.2 cent per kilowatt-hour. It is not probable that this can be reduced to less than 0.6 lb. per kilowatt-hour by any known cycle, even by the mercury steam cycle. This maximum reduction in fuel would only reduce power costs 0.08 cent per kilowatt-hour. This reduction is of significance to the commercial power user, but has little effect on the cost of domestic power. Automatic equipment replacing labor is being introduced steadily into our power stations. Savings from its use must greatly exceed the increased fixed charges on its first cost to produce noticeable decreases in power costs. Further reduction in operating costs are thus possible, but cannot be great, so that large decreases in the cost of power should not be expected from reductions in operating costs with increased load factors.

Conclusions

The considerations presented in the preceding discussions lead to the following general conclusions in regard to the future cost of power:

1. Decreases in the unit costs of constructing power stations and distribution systems lead to lower fixed charges, which in turn result in lower power costs. Steam station costs cannot, however, be greatly decreased below present figures.

2. Little hope of decreased power costs may be expected from outdoor power stations.

3. The cost of the elimination of smoke and dust from flue gases, the use of underground ducts for distribution systems and other expenses to meet social demands, together with the increasing burden of taxes, offset savings produced by engineers in other elements of cost and tend to maintain high rates for electric service.

4. Future developments of water power on the variable flow rivers of the Eastern Seaboard, necessitating supplementary steam stations, will not appreciably lower power costs.

5. Interconnection of large systems, when properly accomplished, will lower investment in reserve plant and thus tend to lower production costs of power.

6. Reductions in power costs to domestic consumers will come through increased use by each such customer of his present demand, thereby increasing his own as well as the system's load factor. Substantial reductions may be expected if this use of demand can be doubled.

7. Commercial power costs are more affected by the factors noted above, such as lower first cost of plant and by interconnections, as well as by economies that may be effected in the operation of the plant. Decreases in costs resulting from these factors will tend to lower rates upon commercial power. Also improved system load factors decrease the cost of commercial power.

8. Study of system peak-load problems may lead to lower station investment and thus to lessened power costs.

9. Savings may still be expected from decreased operating costs through less fuel consumption by the use of more efficient plant or by the employment of higher steam pressures and temperatures or of binary cycles. The more extended use of fully automatic equipment in plant appears also to lower production costs.

10. Commercial expense may be lessened by standardization and simplification of the company's organization, and the careful control of all these overhead charges.

Summarizing the greatest possibilities of decreased power costs to all consumers, both domestic and commercial, will therefore result from more intensive use of present demands quite as much as through savings that may be effected by the utility in producing and distributing the electric power.

Industrial Short Cuts May Introduce Hazards

By L. F. LEUREY
Consulting Electrical Engineer, San Francisco, Calif.

Departures from standard industrial practice do not always produce economies and sometimes prove expensive and hazardous experiments.

PIONEER work of industrial designing engineers and operators who are constantly striving to reduce electrical installation costs in proportion to lowered costs in other branches of industry have, without doubt, greatly benefited the electrical industry. While some of these experimental departures have resulted in advanced practice, too many of them have ended by establishing new hazards to life and property without yielding any actual reduction in cost.

In all of the latter cases the failure can be traced to one of two primary causes—lack of technical knowledge on the part of the designer or hasty adoption of design without full consideration of the field conditions under which the equipment must operate. The reasons which underlie such failures can best be exemplified by typical cases which unfortunately are not only of past record but are of common occurrence in present every-day practice.

Group excitation of synchronous motors

The rapid introduction of general-purpose synchronous motors in the industrial field, and especially in the small-size range, has brought with it the necessity for individual exciters. These exciters, due to small size, add considerably to the motor cost and further complicate maintenance on account of the incidental problem of commutation. There is a natural temptation to lower first cost and simplify maintenance by running common excitation circuits to these motors from a central d.c. supply.

Where this practice is confined to a compact group of motors located in a single building, such as a compressor plant, it is not subject to criticism provided the circuits are properly installed and the proper control equipment is installed. A number of industrial operators, however, have extended the practice to embrace large groups of motors scattered throughout the buildings of their plant. These motors are necessarily non-attended and never under close technical observation and the failure of the common excitation circuit has led to many expensive burnouts with still more costly consequential damage from plant interruption.

Limit switches on hoists

Limit switches are installed on hoists and elevators for the dual purpose of protecting life and protecting the equipment. The very nature of their duty precludes any thought of cheap installation and yet sometimes we find that they fail to function due to flimsy mechanical construction, or due to a secondary failure of the auxiliary equipment to open the circuit.

In most of these cases there is probably no conscious attempt to cheapen the installation, but the weakness results from failure to realize the importance of the function involved. It is not commonly recognized that thousands of electrical failures are the result of mechanical weakness. The electrical design too often stops when the problem of electrical conductivity has been solved.

In the case of auxiliary equipment, limit switches are often connected to the same contactor that controls the energy circuit. This contactor is subject to continuous and heavy duty and at a critical time the contacts may freeze and fail to open the circuit with disastrous results. Considering the insurance features involved, the limit switches should always control the circuit through an independent contactor, liberally rated, and whose sole function is to effect an emergency stop. Where human safety is not involved, and where the duty of the equipment is light, there can be little criticism in connecting limit switches to the service contactor.

Foreign holding circuits

Many industrial plants equipped with large motors and covering extensive acreage are necessarily equipped with 2,300-volt motors, as well as motors of lower voltage in the small-size range. In the control equipment of 2,300-volt motors the potential transformers for supplying energy to holding coils are an expensive, though necessary, part of the equipment.

Some industrial operators have attempted to lower costs by supplying a foreign holding coil circuit to all 2,300-volt motors from a central 440-volt or 550-volt supply and thus avoiding the purchase of potential transformers. This practice is very dangerous and is of doubtful economy when the cost of interruptions and of industrial accidents are taken into account. Cases have happened where this circuit has been opened by accident or by authorized persons, and later closed without warning, causing men to be caught unawares by the driven machinery.

Not only does this acute danger always exist, but there is a further danger to maintenance operators from the existence of this "foreign" circuit. Sometimes new electricians are employed in plants who are so familiar with the conventional, self-contained, holding circuit that they fail to realize the presence of the 400 or 550 volts when working on the control equipment.

To a seasoned operator in the central-station field the following paragraphs must seem superfluous, because if there is one lesson burned into the consciousness of such an operator it is to guard at all costs the integrity of the exciter circuit and to shorten it as far as design will permit. In industrial plants, where exciters are not so extensively employed, there is a tendency to use exciters as a source of miscellaneous direct current requirements, not only within the power house, but often external thereto. Where exciters possess reserve capacity it is naturally cheaper to tap such a source than to install an independent motor-generator.

The danger of grounds and shorts on an exciter circuit is naturally aggravated by its resultant action on voltage regulators, but is also a direct source of danger to the equipment should a prior ground exist. The writer personally witnessed one such occurrence, where a double ground short circuited a portion of the revolving field of a waterwheel generator, with the resultant shearing of sole-plate holding bolts.

Starting of wound-rotor motors

One of the most common troubles in industrial plants is failure to recognize the starting limitations of wound-rotor induction motors. Experienced operators know that speed control of wound-rotor motors is as much a function of torque output as it is of secondary resistance. Inexperienced designers, not realizing this factor and desiring to minimize the cost of starting resistance, connect such motors to heavily back-geared loads with insufficient grids in the rotor circuit. Very slow-speed machines with large gear reduction often contain excessive backlash in the gearing so that the driving motor can attain considerable speed before any torque output occurs. This allows the motor to accelerate too rapidly and produces a triphammer blow on the gearing, which is often destroyed by this condition.

The writer was called in on two occasions, one being gear trouble with cement kilns and the other being similar trouble with the gearing of a swinging bridge. In both cases the faulty conditions were quickly corrected by installing adequate resistance in the rotor circuit.

Feedbacks in control circuits

One of the most dangerous cases of false economy occurs in the failure to provide adequate disconnecting switches in remote-control circuits and in the case of interlocked motor trains. The complex requirements of modern industrial plants are requiring more than ever that motor trains be interlocked to prevent conveyor jams and that much of the equipment be of the push-button or automatic starting type.

There is a tendency among shortsighted operators to omit disconnecting switches on control circuits and on interlocks on the theory that they can make repairs when all of the equipment is shut down. The ability to shut down everything in a large plant rarely occurs and in working on such control system there is always present the danger of "feedbacks" from other equipment. The only safe procedure is to provide each switchboard or control station with a single, well-marked, disconnecting switch that will clear all foreign circuits when the switch is opened.

The above illustrations do not pretend to be exhaustive of the dangerous practices that creep into industry under the guise of economy. They serve, however, to illustrate the fact that a practice, safe under one set of conditions, may be dangerous to life and to property under different conditions. Above all, they serve to point out that before short cuts to established good practice are undertaken adequate design and a knowledge of every circumstance are the only reliable guides to safety.

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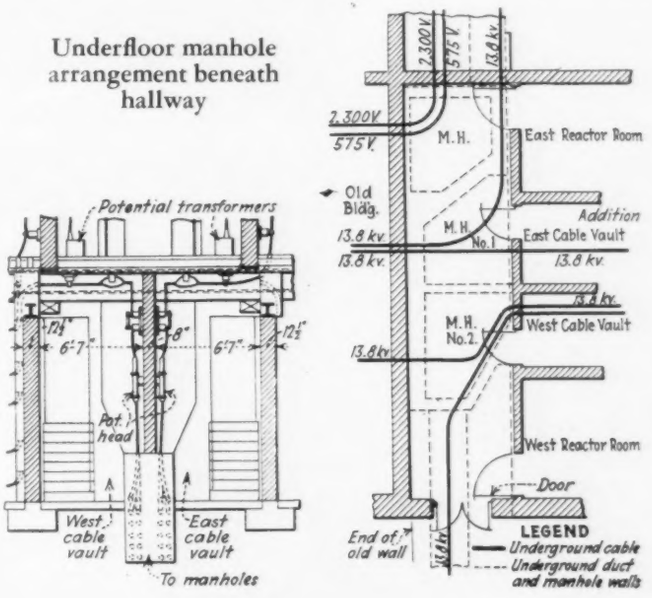
Corridor Manholes Serve as Cable Room

Space limitations in the enlarged Grafton Street substation of the Worcester Electric Light Company precluded the construction of a cable room from which the feeders could be connected to the underground system. The feeders are carried down from bus structures on the second floor to cable vault compartments on the first floor, through current transformers on the ceiling, disconnecting switches and potheads as shown in the illustration at the left. Provision had to be made for some convenient junction point where the cables from the vaults could be led to the underground ducts or from one side

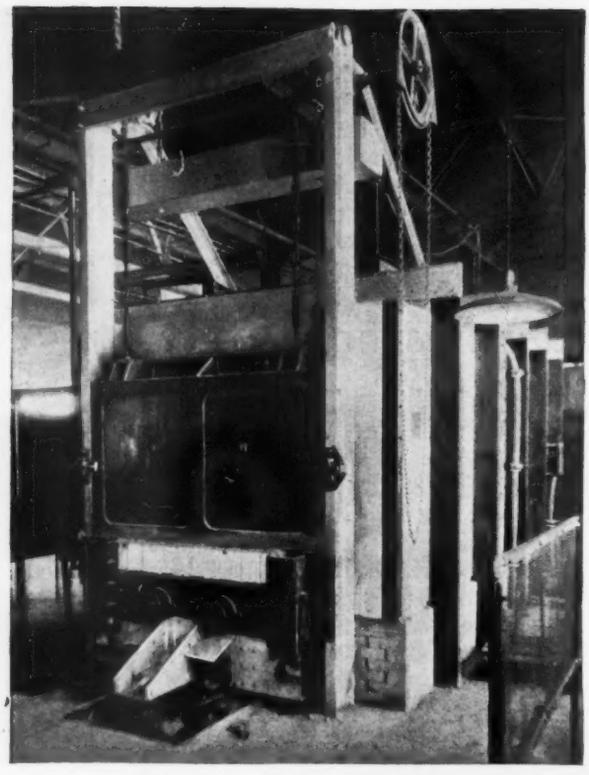
Underfloor manhole arrangement beneath hallway



of the building to the other, within the limits assigned for the structure. These requirements were met with a minimum of space and without sacrificing either accessibility or flexibility by using the space under the ground floor of a hallway leading to the new section of the substation. As shown in the right-hand view, the underfloor space was divided into three compartments, each concrete lined and excavated to manhole depth. Access is had through standard manhole openings with covers set flush in the floor. The manhole at the east end of the hallway was formed by a former outdoor distributing manhole. The two new compartments take care of cable ties between the old and new bus structures and connections from these to the duct systems.

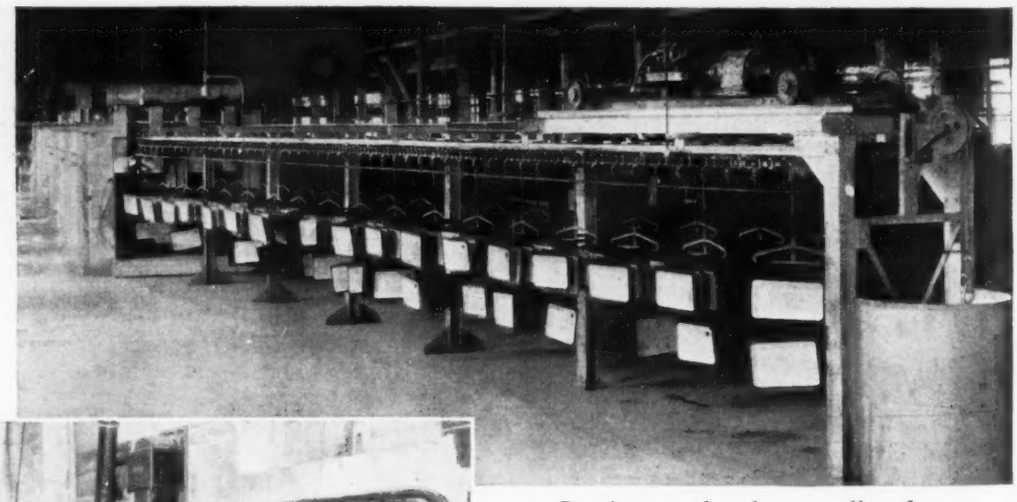
Electric Heat a Production Aid

ONCE considered to be a luxury which only the custom makers of products could employ, electric heat has become an almost indispensable aid in both the quantity and quality production of many familiar articles. Not only are manufactured items improved but costs, where carefully controlled and work scheduled, have been lowered and working conditions vastly bettered through its use. Operating companies composing the American Gas & Electric Company have been active in pushing this load and the illustrated applications on this and the three following pages are all from industrial plants served by units of that system.



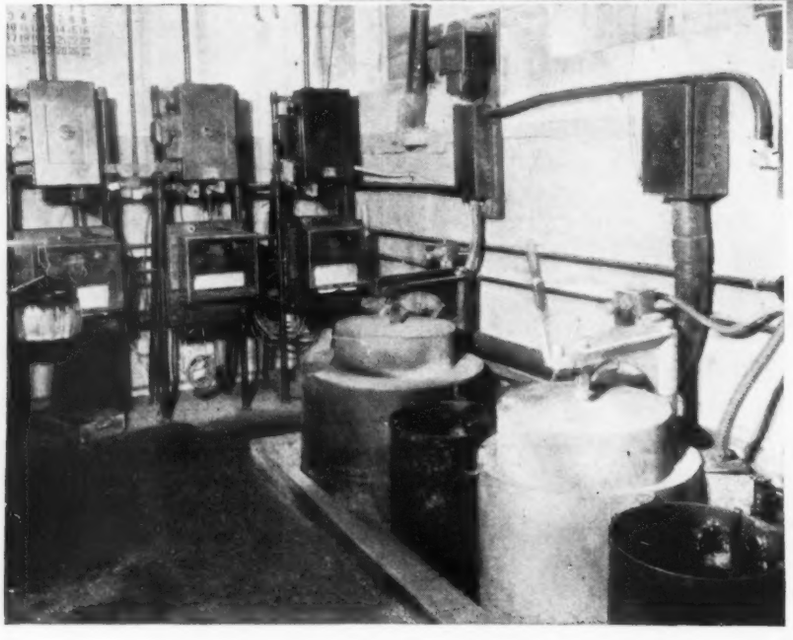
250-kw. electric annealing furnace

This furnace shows a fuel economy of 1,760 kw.-hr. for 6 tons of steel file blanks. Maintenance costs and repairs are materially less than for fuel-fired equipment. Heller Brothers Company of Newcomerstown, Ohio, found general appearance and cleanliness two factors in its operation.



Continuous electric enameling furnace

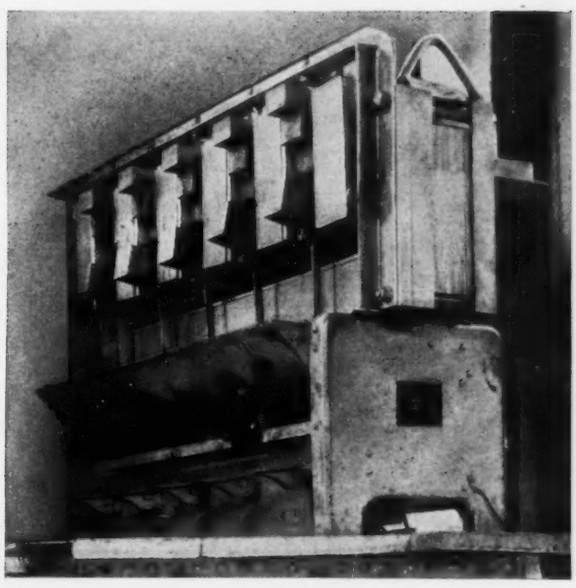
At the Newark, Ohio, plant of the Wehrle Company, manufacturer of stoves and ranges, electric heat is used for enamel baking. The furnace and annealing chamber is 83 ft. long, 13 ft. 9 in. wide, 10 ft. high. The capacity is 583 kw. under maximum loading. Here, as in many other plants, the economical use of large-scale electric heat treating depends on scheduled, high-load-factor production.



Electric heat in shoe making

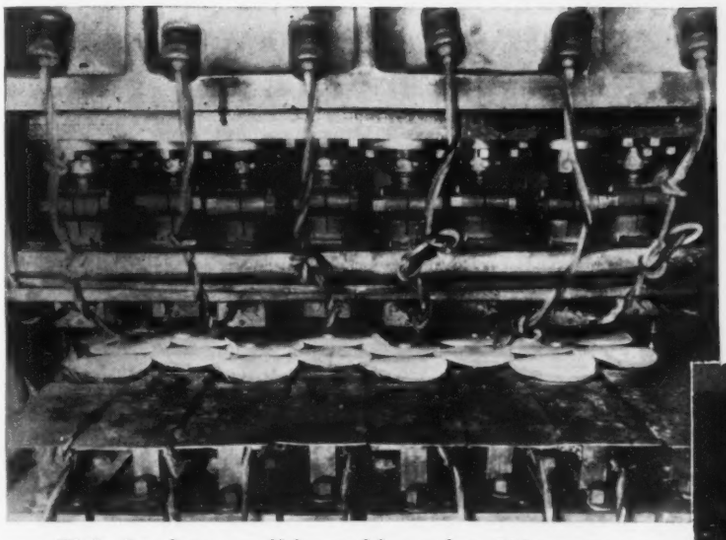
These two 10-kw. vertical cylindrical furnaces at the Portsmouth, Ohio, plant of the Selby Shoe Company are used to harden the steel shanks of "Arch Preserver" shoes. Each furnace is equipped with a Leeds & Northrup recording temperature control maintaining heat at 1,560 deg. F. Approximately 100 shanks are hung on a holder making up one charge, which requires three to seven minutes for treating.

Aid in Many Industries



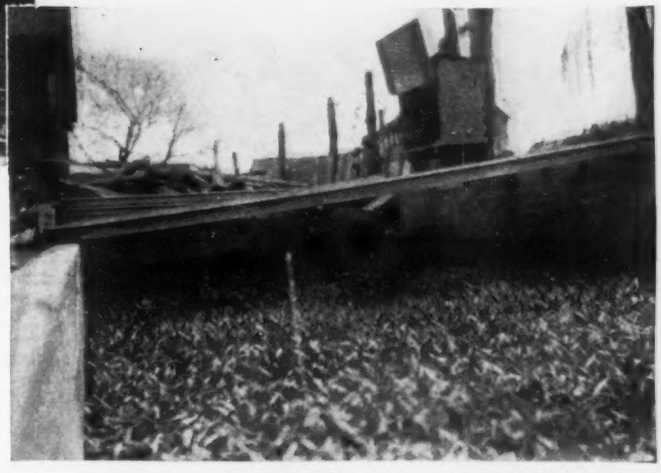
Electric rivet heater

Skepticism soon gave way to enthusiasm when users of electric rivet heaters found that the electric way possessed many advantages. Among them are rapidity and uniformity of heating. Electrically heated rivets stay hot longer because they are heated from the center out. The Broderick Boiler Company of Muncie, Ind., has installed nine of these heaters for rivets 1x6 in. and 1¼x6 in. They are designed for continuous operation and hold five rivets each. The heating period is automatically timed.



Eight-head paper dish machine using 900 watts on each set of dies

Better operating conditions, better production and elimination of fire hazard led a Marion, Ohio, manufacturer to substitute electric service for gas here. This machine operates ten to twelve hours a day with the full 7.2 kw. connected.

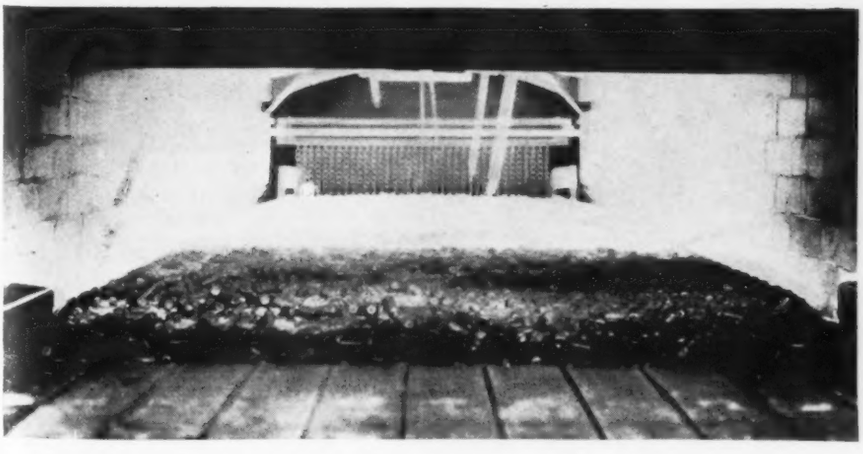


Tomato plants grow in electric hotbed

This ten-sash hotbed, 6 ft. wide, 30 ft. long, is similar to ordinary manure beds except that more attention has been given to insulation against heat losses. A lead-sheathed heating cable, designed for direct contact soil heating, was laid back and forth along the bottom of the hotbed and buried under 6 in. of fine soil in which the seeds were planted; 240 ft. of cable was used and connected through a three-heat control switch to dissipate 2,000, 1,000 or 500 watts per hour on 220 volts. The tomato seed quickly germinated and the plants grew rapidly, the bed being kept at a uniform temperature at night. On cold, cloudy days 1,000 watts kept the bed at the temperature most favorable for growth; no heat was necessary when the sun was shining. The weather was unusually cloudy with considerable snow, but the plants grew rapidly and were ready for transplanting in exactly 28 days after sowing. Due to inclement weather, comparable manure beds were unsuccessful.

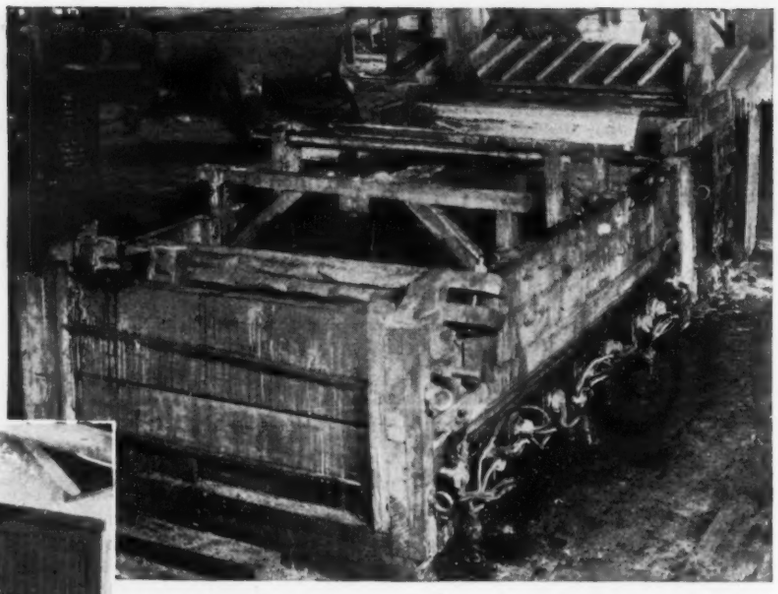
150-kw. "chain hearth" furnace

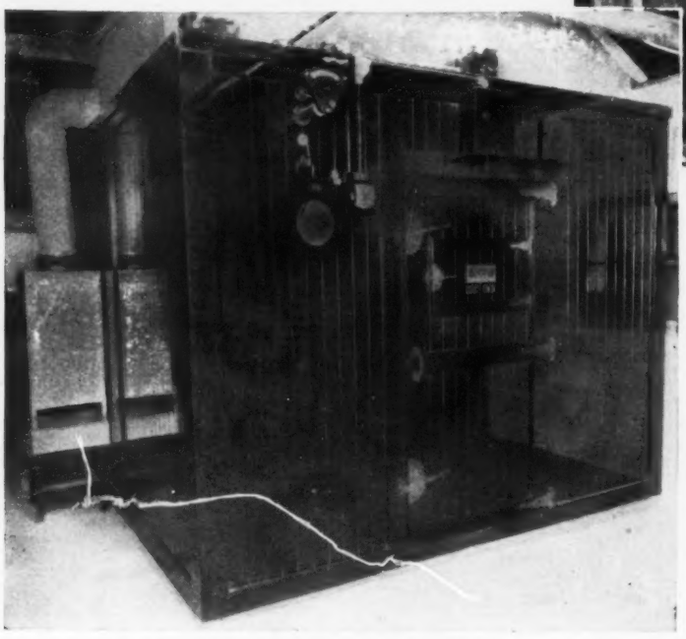
A view from the charging end showing thermocouples, for "zone" temperature control, extending from the roof. Thirteen furnaces at the Canton mill of Timken offer abundant proof of their acceptance by this organization. They have a total connected heat load of 7,640 kw.



Tallow melting for belt manufacture

Crude and unprepossessing in appearance, this 9-kw. electrically heated vat is nevertheless one of the most notable of production aids at the Kingsport, Tenn., plant of the Slip-Not Belting Corporation. Here nine 1,000-volt, 32-in. heating units supplied with 220-volt, three-phase service are evenly distributed crosswise in the tank on 12-in. centers in 1¼-in. pipes about 3 in. from the bottom. The units are connected in wye series to three double-pole, double-throw switches which offer flexibility of warming up and operating. The annual consumption of this tank is 14,000 kw.-hr.



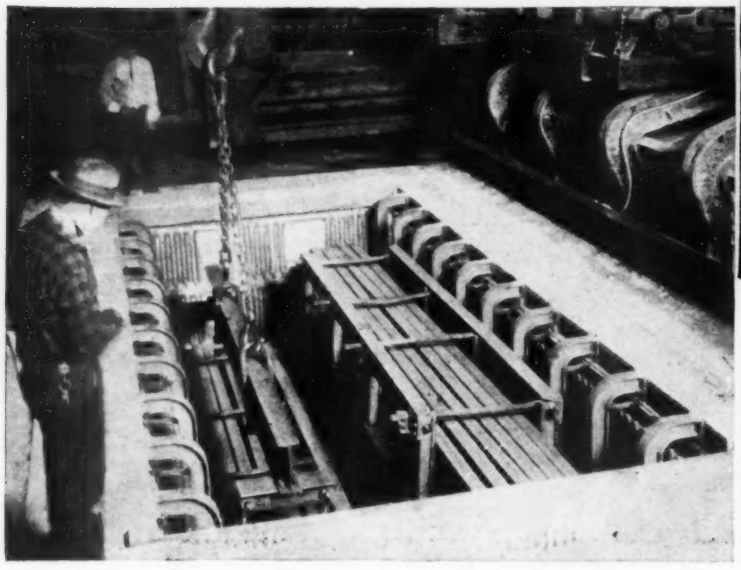


Commercial incubator heating

52,000-egg incubators at the Shatto Hatchery, Dunkirk, Ind. The connected load is 7 kw. Consumption of energy is about 1,000 kw.-hr. a month. Uniformity of temperature is the advantage here.

12-kw. silk steamer installation

This water-pan strip-heater silk steamer is an experimental installation sponsored by the Scranton Electrical Company. The user found the silk so processed to be of better quality than that treated by former methods. An energy consumption of 1,300 kw.-hr. a month or 0.3 kw.-hr. per pound of silk was recorded.

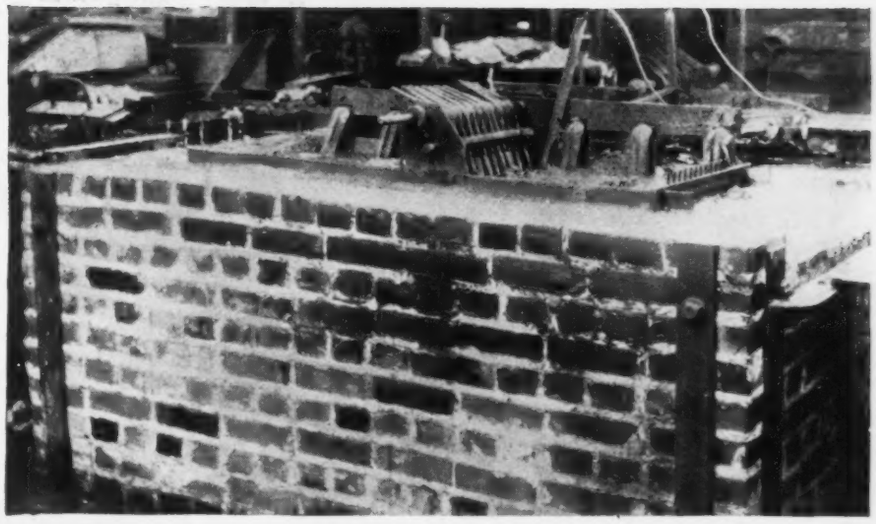


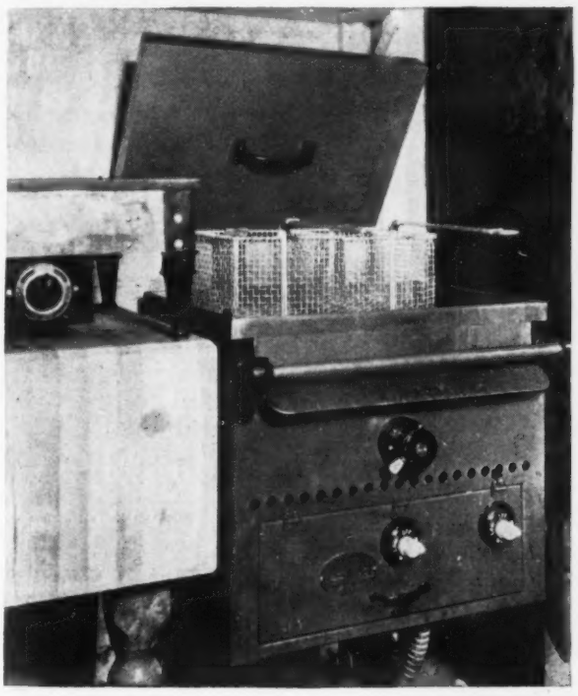
850-kw. annealing furnace

This is but one of five similar installations at the Canton, Ohio, plant of the Timken Steel & Tube Company. Heating elements are of the T-grid type, mounted on the bottom and side walls of the pit. They are divided electrically into two circuits. Each circuit is provided with individual control which gives two connections, one 440-volt, five-phase wye for starting heat and the other 440-volt, single-phase series for soaking heat. The first represents a demand of 425 kw. for each circuit or 850 kw. total and the second a demand of 142 kw. per circuit or 284 kw. total.

Two 30-kw. wire-tinning baths

At the Fostoria, Ohio, plant of the Seneca Wire & Manufacturing Company immersion-type heating units and automatic temperature-controlling equipment are used in heating wire-tinning baths. So satisfactory, because of temperature uniformity and practicability of results, have these installations been that three additional tinning baths have been changed from coal-fired to electric operation.





Electric fry kettle

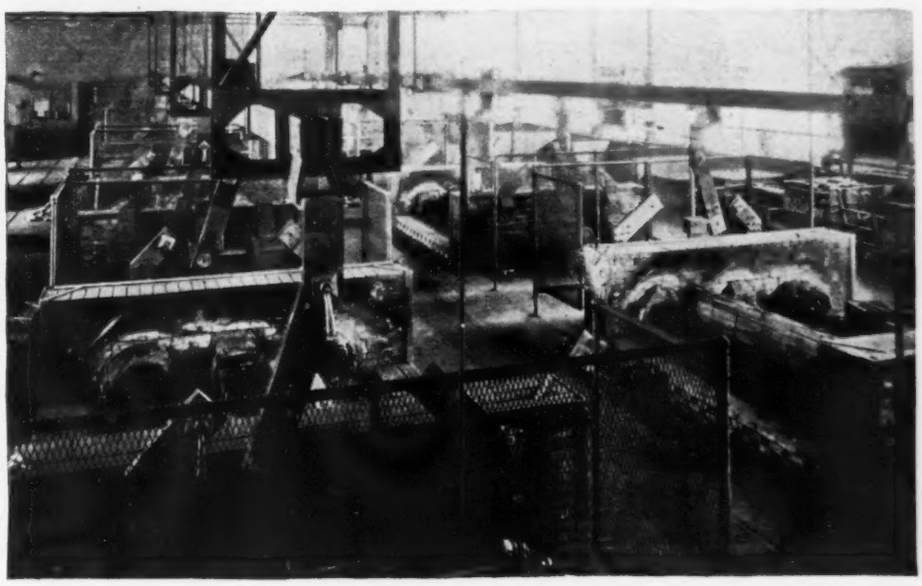
At Casa Pedro, Atlantic City, N. J., this electric fry kettle insures uniform and satisfactory food preparation and directly and indirectly delights both chef and patron. The wattage depends upon the size of the vat or kettle. Four kilowatts are usually employed for a 16-in., 5 kw. for a 20-in. and 7 kw. for a 24-in. kettle. The following information applies to a one-month test in a medium-sized bakery. Twelve days on which both bread and cake doughnuts were fried and twelve days on which cake doughnuts alone were fried. An 8-kw. Ranier immersion type, 24-in. unit was used.

Cake doughnuts, dozen.....854
Bread doughnuts, dozen.....172

Kw.-hr. required for heating-up periods 127
Kw.-hr. required for actual frying (cake) 66
Kw.-hr. required for actual frying (bread) 56
Total kw.-hr. required 249
Watt-hours per dozen actual frying (cake) 77.3
Watt-hours per dozen actual frying (bread) 326
Watt-hours per dozen frying and heating up (bread).....450
Watt-hours per dozen frying and heating up (cake).....201
Per cent of energy used for heating up 51
Energy cost per kw.-hr.....$.0662
Energy cost per dozen (cake) $.0133
Energy cost per dozen (bread) $.0298

Graphitizing of carbon brush stock

Electric calcination of the bulk material from which carbon brushes are cut requires a high temperature and close control. The maximum heat is extremely high, being above the melting point of most ceramic materials and considerably above the melting point of iron. The electrodes and bus work for switching the heavy currents from section to section shown are in the Fostoria, Ohio, plant of the National Carbon Company.



Hygienic Value of Ultraviolet Radiation

By JANET H. CLARK

School of Hygiene and Public Health, Johns Hopkins University

Effects calcium and phosphorus utilization.

Tonic effect yet unproved.

Therapeutic applications generally unknown in effects.

THERE are two general methods by which a sound basis for the science of hygiene can be acquired. The first is by the critical use of accumulated experience and the second by scientific observations and experiments as in other branches of medicine. Unless the experimental method is applied, knowledge would have long been at a standstill, for such results as can be obtained by the first method were reached in the days of Hippocrates and Galen and the generalizations they made from experience still hold good.

Our belief in the value of outdoor light and air is an example of such a generalization from experience, and a comparison of rural and urban death rates tends to establish it scientifically and to show that, in sipte of the greater sanitary improvements in urban life, sanitation is not wholly able to counteract the dangers of segregation and indoor existence. But from a modern viewpoint any such generalization is unsatisfactory unless analyzed by experiment, for indoor and outdoor air differ in many respects, some of which may be important and some unimportant, in so far as their effect on health is concerned. Indoor and outdoor air differ in chemical composition, degree of ionization, dust content, conditions of temperature, humidity and air motion, and indoor life differs from outdoor life also in the quality and quantity of the light received. Without scientific experiment it would be impossible to judge the relative importance of these different factors.

Experimental work has led to the conclusion that the evils of poor ventilation cannot be attributed to the small decrease in oxygen and increase in carbon dioxide found indoors, or to the presence of volatile organic matter, and there is no evidence as yet that the degree of ionization of the air has any hygienic significance. Although, under special conditions, noxious fumes and gases and high concentrations of dust may be harmful to health, the ill effects of indoor air seem to depend not so much on chemical impurities as on its physical properties, temperature, humidity and air motion. But outdoor and indoor life differ also in the quality and quantity of the light received as well as in the physical properties of the air. Visible light is diminished indoors to such an extent that usually artificial light is necessary both day and night to bring illumination up to the value necessary for eye efficiency. Visible light, however, seems to be important for vision only and the variations indoors and outdoors are not known to have any general hygienic significance.

Recently experimental work has demonstrated that ultraviolet radiation shorter than 315 μ can cure or prevent rickets, and this fact has naturally led to the assumption that the absence of these anti-rachitic rays indoors may account in some measure for the general deleterious effect of indoor life on the human being. The discovery of the value of ultraviolet radiation as a specific cure in rickets has led to a great increase in the types of ultraviolet lamps on the market. In addition to the many variations in the forms of mercury and carbon arcs now available to the public, this interest in ultraviolet radiation has led to the development of new types especially designed to produce only the ultraviolet rays present in sunlight. The addition of sources giving small amounts of ultraviolet radiation to sources giving illumination for visual purposes, in the so-called dual-purpose lighting, makes it possible now to do away with the inequality of indoor and outdoor light in respect to ultraviolet radiation. Also, the development of various types of ultraviolet transmitting glass for use in windows makes it possible to have indoor sunlight which still contains a certain proportion of the ultraviolet radiation of outdoor light, though the amount present is extremely small, except when direct sunlight falls on the window in question.

Knowledge lags behind application

This activity among the manufacturers of ultraviolet lamps and ultraviolet transmitting glass has made ultraviolet radiation available for our use in a very flexible form which is highly advantageous, both to the practitioner and, if judiciously used, to the general public. Unfortunately our knowledge of how much ultraviolet radiation we need and when it can be used to advantage lags behind our knowledge of how it can be conveniently produced. *It is not enough to say that outdoor life is healthy, that it will cure tuberculosis and that therefore we must have ultraviolet radiation indoors to promote good health.* Before coming to that conclusion one must consider what part, if any, ultraviolet radiation plays in the clinatic treatment of tuberculosis, and what benefit, if any, it has in improving general health.

Solar ultraviolet radiation contributes indirectly to health because of its lethal action on bacteria, and it is possible that sublethal doses may affect the virulence of organisms and their susceptibility to other lethal agents, such as heat.

Ultraviolet radiation has been shown to exert a curative and preventive action in rickets. This is a specific effect due entirely to rays shorter than 315 μ. It is immaterial whether the ultraviolet radiation is obtained from carbon arcs, mercury arcs or sunlight, provided there is enough energy in the short wave lengths to activate a substance, known as ergosterol in the human skin, which regulates the utilization of calcium and phosphorus in the body and thereby favors bone formation. This is a specific effect and it cannot be argued that because ultraviolet radiation prevents or cures rickets it is good for other diseases. There is evidence accumulating to show that this specific action not only favors bone formation and prevents rickets but also prevents tooth decay, at least during childhood, but evidence on this point is scanty as yet and on this basis there is as yet little evidence that ultraviolet radiation is necessary for the maintenance of good health in adults.

General tonic effects unproved

The value of ultraviolet radiation in the treatment of tuberculosis is hard to evaluate as it is only one factor in the climatic cures that have been reported. The general opinion is that it is a non-specific aid to other forms of treatment.

Definite experiments, planned to test the effect of ultraviolet radiation on resistance to infection, have in general been entirely negative. It is found that the power of the blood to kill organisms may be increased or decreased after radiation. The power of the skin to resist infection after radiation may be greater or less than normal, depending on the intensity of the exposure. The power of the body as a whole to resist infection has been investigated both in animals and man, and so far there is no evidence that it is increased by daily or weekly exposures to ultraviolet radiation. *It is well known that the frequency of colds, influenza and pneumonia is greater in the winter, but it is doubtful if this is related in any way to the lowered amount of ultraviolet radiation in winter sunshine.*

With one exception investigators have found no increase in resistance to respiratory infection either in animals or man as a result of exposure to ultraviolet radiation. These conclusions are, of course, open to criticism and revision. It is possible that in their zeal for supplying ultraviolet radiation the experimenters went too far and supplied more than a beneficial amount. It is possible that a certain amount of ultraviolet radiation is necessary to maintain health while larger doses are ineffectual or even deleterious. If that is so the minimum that must be provided is small and may be reached or exceeded by persons living a normal life. There are certain classes of individuals who may actually be so confined indoors, as for example invalids and workers in certain industries, that they may never receive even this hypothetical minimum. And it is true that animals confined entirely indoors show improved health when the use of ultraviolet transmitting glass gives them a fraction of the solar ultraviolet radiation. But this may be due entirely to the specific effect of ultraviolet radiation on calcium and phosphorus utilization and not in any sense to its so-called tonic effect. This tonic effect is indeed as yet unproved. It is at best a generalization from uncritically analyzed experience.

The value we attribute to the sunshine in open air may eventually be laid to the benefits of air movement and exercise. Deaths due to pneumonia and influenza increase in the winter, but this is probably not due to the lack of ultraviolet radiation, as experimental results have shown that there is no increase in resistance to pneumonia after exposure to ultraviolet radiation, at least in laboratory animals. *It has sometimes been stated that a large amount of ultraviolet radiation is harmful. But on this point too there is no satisfactory experimental evidence.* The bad effects of tropic life seem to be due entirely to heat and humidity, not to excessive sunshine, and if the eyes are carefully protected moderate amounts of ultraviolet light have not been shown to produce harmful effects.

Studies on small organisms and single cells have shown that a very small amount of ultraviolet radiation stimulates growth, a larger dose hinders growth, and a still larger dose kills the organism. When ultraviolet radiation is applied to human beings the results are different, for the radiation penetrates so short a distance into the skin that the effect is superficial and no serious damage can be done, unless the area is very large and the dose very great. It is possible too that the effect is too superficial to bring about the stimulation in human beings that can be demonstrated in small organisms. In the present state of our knowedge no definite statement can be made on this point.

Outside of its specific use in rickets, ultraviolet radiation is frequently a non-specific aid to other forms of treatment, especially in climatic cures, but its value as a general tonic is as yet undetermined and optimistic statements as to its value in the maintenance and promotion of health should be taken with judicious scepticism.

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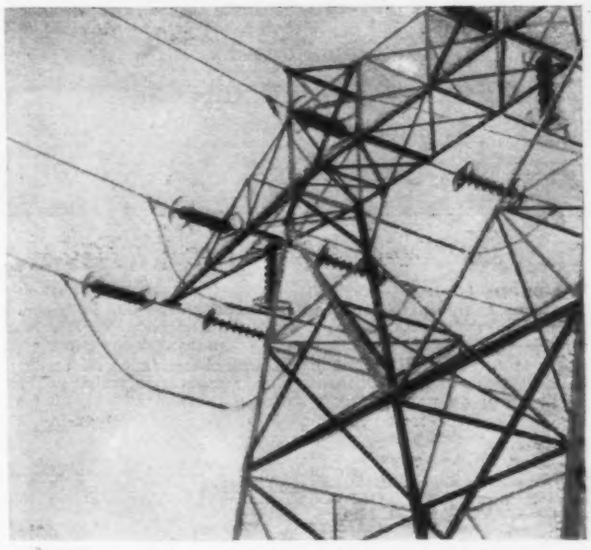
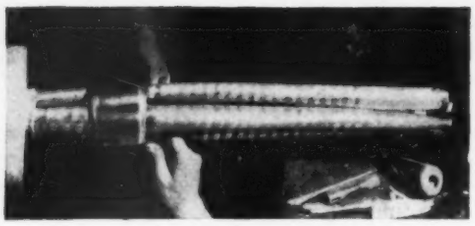
Tubes Stabilize Jumpers



To hold the jumpers on the 110-kv. circuits entering the Cabot switching station of the Turners Falls Power & Electric Company in such a position that the distance from any point on the loop to ground will exceed the gap across the insulator grading shields, the New England Power Company attaches guy protectors to the loops. The stiffening is particularly effective where phase wires pass inside the tower framing.

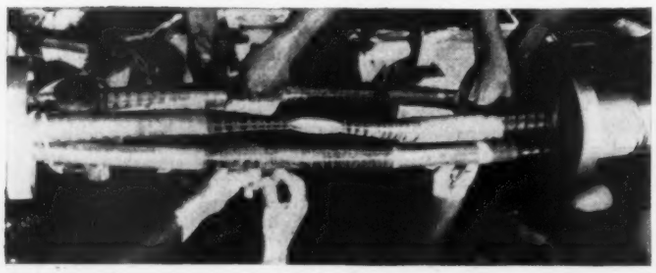
66-Kv. Three-Conductor

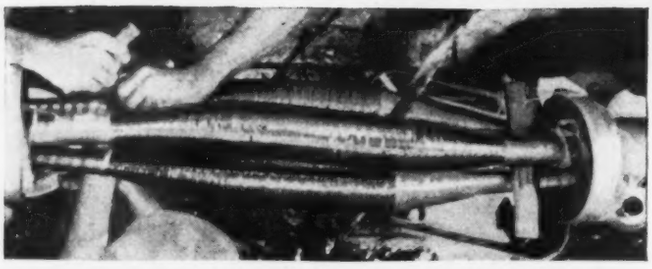
The cable carries load at 66 kv., but due to regulation requirements the voltage may rise to 69 kv. The cable is rated at 75 kv.

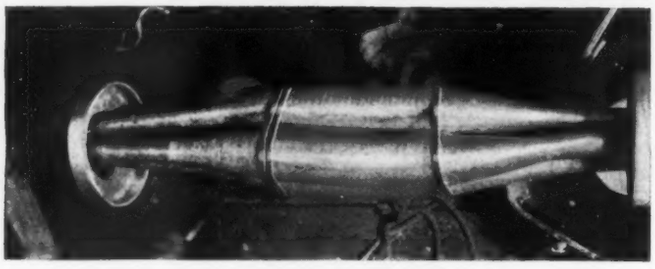


The semi-stop barrier is applied

The stop barriers permit oil pressure to be maintained in the cable while the joint is being made.





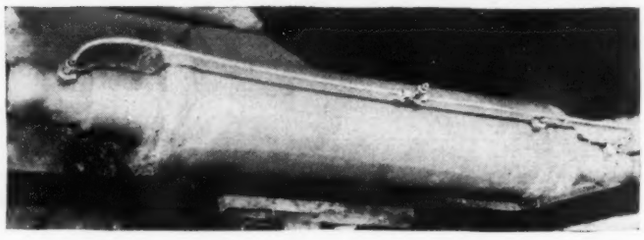


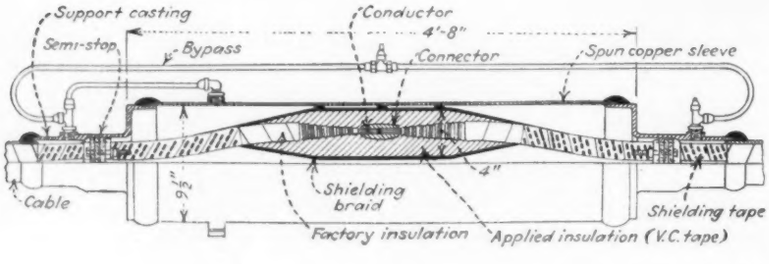
Taping and shielding

There are seven steps in the mill insulation and each phase of the joint is built up with hand-applied low-loss, varnished-cambric tape to a maximum diameter of 4 in. at the center and tapering off to the mill insulation on each end. The distribution of the tape is such as to cause the distribution of stresses across the joint to be as uniform as possible and to permit reasonable limiting gradients. Each conductor joint has a copper-braid shield.

Separate manholes for each joint

The manholes are standard octagonal transmission type, except that the ends are slotted to permit the cable to be laid into its new position without necessitating any undue bending. Removable slabs slide into position in the ends to form the end walls. The bottoms of the slabs are grooved to fit around the cable. The tops of the manholes are made of removable concrete slabs because they will not be subjected to traffic and because they readily permit elevating the ends of the cables in the preliminary splicing operations. Manholes are designed to have the joint placed in the center because each manhole will never house more than one joint. Joints are supported on columns built up from the floor of the manhole. No slack cable is allowed in the manhole, but expansion loops are provided to take up the slack outside the manhole walls.





Cable oil by-passes the joints

When the joint is completed a ⅜-in. copper tube permits the cable oil to pass around it.

tor Cable Joint

By E. F. NEUZEL

Columbia Engineering & Management Corporation, Cincinnati, Ohio

DIFFICULTIES experienced in obtaining correct relay operation under certain abnormal conditions on the four 66-kv. lines* of the Union Gas & Electric Company installed last year between its base-load generating station at Columbia and the Hartwell terminal substation made it desirable to transpose two of the circuits to insure entirely dependable protection. This involved cutting two of the 66-kv., three-conductor, oil-filled cables and splicing them together in their new transposed positions with three-conductor, oil-filled joints.

Although joints of this type have been made on three-conductor, oil-filled cable of 35-kv. rating, these are the first 66-kv., three-conductor joints made. The joints are the totally shielded type and have semi-stops to permit their construction and treatment, with positive oil pressure maintained on the cable, on both sides of the joint. These semi-stop joints are by-passed with $\frac{3}{8}$-in. copper tubing after the joint is completed.

Although the joint is filled with degasified oil under pressure, it is not completely oil-filled as is the cable, because the hand-applied low-loss, varnished-cambric tape, of which the joint is made, is not permeated in its entirety with degasified oil due to its lack of porosity. However, any minute quantities of air or moisture that might be present in the wrappings are in dissolved form and harmless. The design is such that on short-time, high-voltage tests the joint is as strong as the cable and the limiting gradients are of such values that the aging of the joint tends to approach, so far as possible, the ideal permanency which obtains in the oil-filled cable structure. The joint was designed and its construction supervised and guaranteed by the General Electric Company. Construction work was done by the Union Gas & Electric Company in collaboration with the Columbia Engineering & Management Corporation. The joints were tested with a kenotron set at 115,000 volts to ground. One cable was cut in service August 8 and the second one August 23.

Schedule of Operation for Preparing 66-Kv., Three-Conductor, Oil-Filled Joint

Time A.M.	Operation	Time Elapsed Hours	Minutes
7:10	Started the joint	..	..
7:40	Test caps were cut off of both cables and phasing out was completed	..	30
8:00	Lead sheath and steel binding tapes removed and the ends tapered to receive the cork gaskets for the semi-stop joints	..	20
8:45	Semi-stop joints assembled and the end bells moved over them into wiping position	..	45
12:10	Semi-stop joints tightened in the end bells, the wiping of the end bells to the cable sheaths completed and the cables lowered into the horizontal position for the connectors	3	25
P.M.			
1:15	The connectors sweated on and dressed ready for stepping the insulation	1	5
1:50	Stepping of the insulation completed, tied down with yarn and flushed with hot oil ready for taping	..	35
7:00	Taping of the phases completed	5	10
8:35	Joint completely shielded ready for the sleeve	1	35
10:50	Sleeve wiped to the end bells, ready for treatment	2	15
11:20	Joint treated with dry CO_2 and vacuum and completely filled with degasified oil and sealed off	..	30
	Approximately	16	10

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Relative Foot-Candles

By M. LUCKIESH

Director Lighting Research Laboratory, General Electric Company, Cleveland, Ohio

It is possible to analyze precisely the several fundamental characteristics of vision and, from these data, to determine the relative foot-candles required for equality of visual difficulty in various situations. When this method of analysis is applied to the average lighting installation the inadequacy of the lighting in many instances is conspicuous.

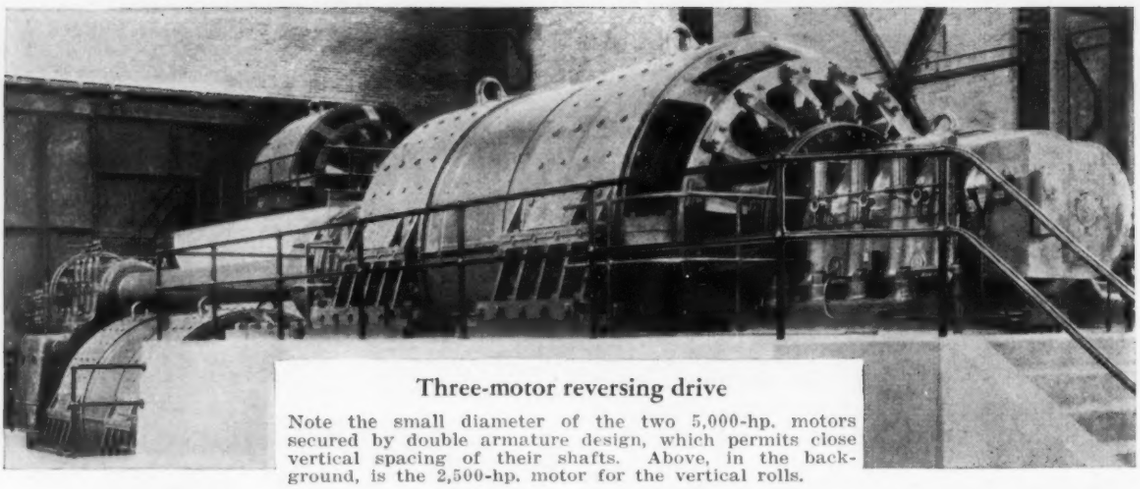
There are many factors involved in seeing, but the following are fundamental: Size of object expressed in minutes of visual angle subtended at the eye by the smallest detail to be seen; contrast between object and its background—definable as the ratio of brightness difference (between object and background) to the brightness of the background and designated as per cent contrast; brightness level resulting from foot-candles and reflection factor; time of exposure of retina to the image of the object. The relationship between these four factors has been quantitatively determined, thus enabling the lighting specialist to make accurate comparisons between practical lighting situations.

A few examples are presented herewith to illustrate the application of this analysis to lighting problems. Several situations differing in size, contrast and time allowed for seeing were assumed and the foot-candles required in each case were obtained from the relationship of the four fundamental factors.

Different Situations—Equal Visual Difficulty

Size of Object (in Minutes Visual Angle)	Contrast with Background (Per Cent)	Time Allowed for Seeing (Seconds)	Foot-Candles for Threshold Seeing
0.8	50	0.17	100
1.5	50	0.17	1
1.4	10	0.17	100
3.0	10	0.30	1
10.0	2	0.30	10

The foot-candles given represent absolute values for threshold seeing, at which the object is seen with 50 per cent certainty. Such visibility is, of course, inadequate for the work-world, but it is a condition at which exact measurement on seeing is possible. In lighting practice, the foot-candles of the table become relative foot-candles and form the basis for a scientific distribution of light to the various visual tasks in proportion to their difficulty.



Three-motor reversing drive

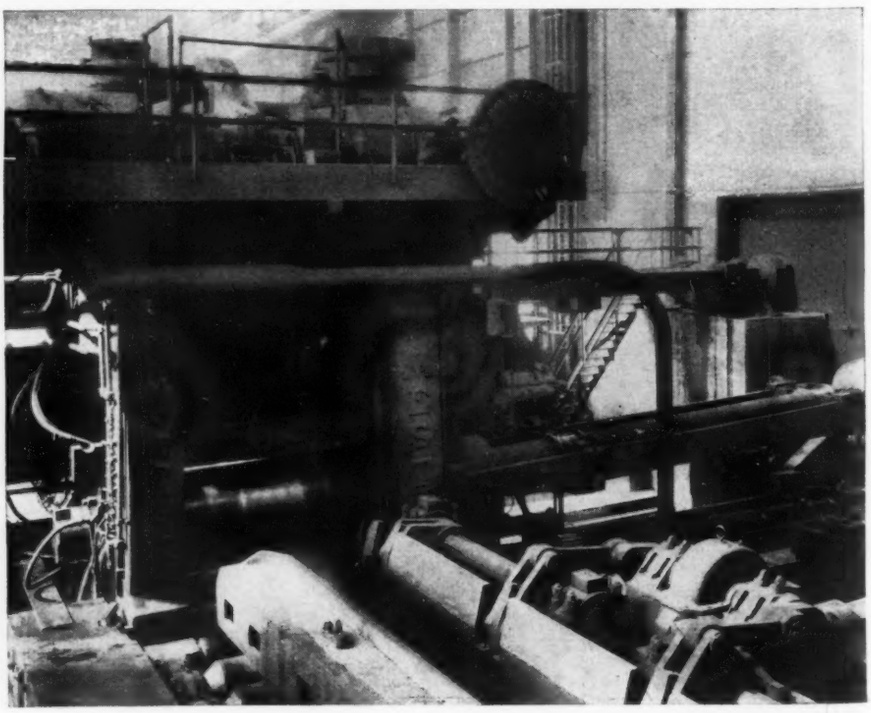
Note the small diameter of the two 5,000-hp. motors secured by double armature design, which permits close vertical spacing of their shafts. Above, in the background, is the 2,500-hp. motor for the vertical rolls.

Twin-Drive Slab Mill Handles 400 Tons per Hour

Ingots measuring 30x64 in. are rolled down to slabs 4 in. thick and 60 in. wide, at the rate of 400 tons per hour, in one of the rolling mills recently installed in the Chicago district.

This rolling mill is a single-stand, reversing unit with horizontal and vertical rolls. The horizontal rolls are directly and separately driven by two 5,000-hp., 40/80-r.p.m., 700-volt direct-current reversing motors arranged for twin drive as shown in the accompanying illustrations. They are of the double armature type, which results in such a small over-all machine diameter that the motors can be installed on a vertical center-to-center distance of less than 7 ft., thus permitting very slight deviations from the horizontal in the shaft and spindle connections to the rolls. Another advantage of the small diameter armature is that by their reduction of armature inertia (WR^2) they decrease power losses in starting and stopping and cut down the time required for a speed reversal. The vertical edging rolls are driven through reduction and bevel gearing by a single 2,500-hp., 700-volt, 79/225-r.p.m. reversing motor. This motor has a single armature of the long-core small-diameter type with a minimum WR^2 characteristic that permits acceleration and deceleration rates corresponding to the horizontal roll drives. The three motors are supplied with direct-current power from a flywheel motor-generator composed of three 3,500-kw. parallel-connected compound-wound generators driven by a 6,500-hp., three-phase, 25 cycle, 6,600-volt induction motor. At a speed of 375 r.p.m. the flywheel and other rotating parts of the set have a total stored energy of 270,000 hp.-seconds.

In the first and following odd-numbered passes the steel goes through the horizontal rolls first. Thus the entering speed of the vertical mill must be equal to or greater than the discharge speed of the horizontal rolls, depending on whether the vertical rolls do not or do make a reduction in the width of the steel. The condition is reversed in the even-numbered passes, for then the vertical rolls come first and the peripheral speed of the horizontal rolls must be higher. This alternate reversal of speed relation between the two sets of rolls is cared for by a double-throw contactor that short circuits one or the other of two rheostats in the shunt field circuit of the motor driving the vertical rolls.



Entrance side of 44-in. slabbing mill

At the right, one above the other, are spindles connecting the shafts of two 5,000-hp. motors to the upper and lower rolls. Above them, and farther back, is the driveshaft to the vertical rolls from the 2,500-hp. motor.

What About Specifications, Guarantees, Free Consultation?

By M. M. SAMUELS

PURCHASERS' engineers and manufacturers' engineers seldom meet face to face or even in direct correspondence. The purchaser's engineer transmits his information through a purchasing agent and the manufacturer's engineer through a sales representative. Of late the two classes of engineers have been having a better opportunity to become acquainted with one another, particularly through committee activities in the industry. Some of the tendency toward distrust and misunderstanding which has been common in the past is being eliminated, but there are still several aspects of the purchase transaction which can be canvassed in an effort to attain perfection in this relationship. Free engineering service, faulty specification writing, the guarantee clauses, shop inspection and test, and entertainment—these are the sources of friction wherever the going is not smooth.

How much free engineering service shall the manufacturers' engineers give to their prospective customers and how much shall the prospective customers accept? Any purchaser knows that when he purchases a finished product he pays for the research and development and for all the trials and tribulations through which a new product must be ushered before it is ready for the commercial market. If, therefore, he needs advice in regard to the application of such products he is entitled to it, knowing that he pays for it, directly or indirectly. Charity and gratuity are not in the picture. On the other hand, the purchasers, and most particularly large-scale purchasers and their organizations (such as, for instance, the N.E.L.A.), are likewise conducting on a large scale research and investigations such as lightning and short-circuit studies, which cannot be conducted in a manufacturer's laboratory. The manufacturers use the results of these investigations to improve existing apparatus and to develop new apparatus.

The following will indicate what should be the line of demarcation between fair and unfair free engineering service:

1. In case a customer has no engineers of his own and purchases his equipment from one manufacturer without any competition, it is quite fair for a manufacturer to furnish all engineering free, because the customer must know that he is paying for it in the end. Whether or not such a customer would do better to obtain the services of an independent engineer and induce competition for the equipment order is his own affair. No one is misleading him.

2. To a purchaser's engineer a manufacturer should furnish all the information on the equipment which he manufactures—engineering information about the design, construction and applicability of the equipment, as well as estimating price.

3. The purchaser's engineer in the end must himself decide whether or not the particular equipment is suited to his employer's need. He must himself decide how this equipment should be arranged in a power house or in a factory; he must design the foundation, housing and connections for the equipment. He is paid by his employer to do all this work, and if he allows some one else to do it for him gratis he is abusing a trust.

4. Manufacturers usually have research and trial facilities by which certain things can be tried out and tested, but the purchaser's engineer often has no such facilities. It would be fair for manufacturers to charge for the services of such facilities, but a custom seems to have been established to furnish such services gratis, and it is therefore quite fair for a purchaser's engineer to accept them gratis, provided that the employer is made familiar with the fact that such services are being obtained gratuitously and knows from whom they are being obtained, because in the end he will pay for it somehow when he purchases equipment.

How much shall a purchaser's engineer specify?

Some manufacturers complain that purchasers specify with too much detail and others complain that they do not specify sufficient detail. Both complaints are often justified, both faults often appear in the same specification and even in one and the same item. Some features which should be definitely left to the manufacturer are quite frequently specified in detail and some features which fall definitely within the purchaser's premises to specify are often left out. Some purchasers prepare no specifications at all, but advise the manufacturer what their requirements are, and the manufacturer then submits proposal specifications. While this may be expedient in some cases, it is unsatisfactory as a general proposition, because it leaves no record of what is required, and there is a possibility that one bidder will get the whole story and another only part of the story. If the purchaser's engineer knows definitely what he wants, it should be a simple matter for him to set it down on paper.

The following is recommended as a guide as to what should and what should not be specified:

1. General clauses stating that the equipment must comply with such standards as those of the Underwriters, the A.I.E.E., the N.E.M.A., etc., should be contained in the specifications. It would be preferable to assume that equipment will comply with such standards and leave out any mention of them in the specifications, but manufacturers frequently do not comply with some of the standards, and it is doubtful if a manufacturer could be legally held to such standards if no specific mention is made

of them. It is therefore preferable to mention them, but such references should be sufficient, and no parts of the codes or standards should be literally incorporated in the specifications.

2. Types of apparatus should be given only if the purchaser has decided on definite types and will not accept any other types, in which case the type desired should be explicitly mentioned. In general, it is much better not to specify any type at all, but to specify fully and distinctly the service which the equipment will be called upon to perform, and to request that the most up-to-date equipment be quoted upon..

3. As regards accessories, there should be a statement that such accessories are to be included, but the number and types should not be specified. For instance, one manufacturer may require two sets of instrument transformers to take care of a number of instruments and another manufacturer may require only one set. It should be left to the manufacturer to furnish the accessories necessary for the equipment on which he quotes, and he should be held responsible for anything that he may leave out.

4. If the purchaser is in possession of some parts or accessories which he desires to use with the new equipment, the specification should contain a detailed description of such parts and how they are to be used, to allow the manufacturer to ascertain that the new equipment will operate satisfactorily with the old parts. There should also be a clause that if the manufacturer is of the opinion that the new equipment will not operate satisfactorily with the old parts, his quotation should include new parts for the purpose.

5. Great care must be taken not to specify special equipment, unless the standard equipment on the market cannot be made to serve the purpose equally well or better. This would seem obvious, but the fact is that special equipment is often specified for the reason that the one who writes the specification is not aware of the existence of the standard equipment.

Circumscribing and "catspawing" should be taboo

6. If for some reason the purchaser desires to use a definite piece of equipment which is not being made by all manufacturers who are requested to quote, such equipment should be definitely identified in the specification, and the name of the manufacturer should be explicitly stated in the specification; circumscribing is vicious, leads to abuses and should not be tolerated.

7. Any limiting conditions, such as available space or similar governing conditions on the purchaser's premises, shall be clearly given in the specification. The available facilities, or those to be made available, for handling the equipment on the purchaser's premises shall likewise be given in the specifications.

8. The border line between the manufacturer's equipment and the purchaser's equipment connected to, or to be operated by, it should be carefully studied before the specification is made. Most of the arguments between manufacturers and purchasers are caused by misunderstandings in regard to such border line conditions, the lack of clear and definite statements as to where the manufacturer stops and the purchaser begins. Such simple questions as to who is to furnish the bolts to attach the manufacturer's equipment to the owner's foundation cause endless delays and litigation. It is important to establish definite lines of demarcation in the specification for such border lines.

9. Purchasers should insist that the manufacturer's bid contain a clause that the equipment will comply with the purchaser's specification. If the manufacturer must take exception to any of the purchaser's requirements, he should be very explicit in listing such exceptions in detail, giving the reasons for the exceptions. Some manufacturers, even some of the most prominent ones, are in the habit of making no mention in their own proposal specifications to the purchaser's engineer's specifications, as though the latter never existed. They are also in the habit of conveniently quoting on different material than asked for in the purchaser's specifications, without explicitly calling this fact to the attention of the purchaser. This is an arbitrary and discourteous procedure which should not be resorted to by reputable manufacturers. They are no doubt unaware that this fact has lost them many an order.

10. When a piece of apparatus is specified, it is generally taken for granted that all integral parts of same are to be included, and it is not necessary to specify each integral part. When, for instance, an oil circuit breaker is purchased it may be assumed that oil will be furnished, unless it is expressly stipulated that it will not.

11. Each item in the specifications should be logically and carefully numbered, and each group of apparatus should be combined in a consecutive lot of items.

12. Each lot of equipment should be listed in a separate group in accordance with its location, and whenever necessary cross-references should be given in the various items, stating, for instance, that a control switch in item 5, which is a panel, is to control a breaker of item 100. This method not only avoids misunderstandings, but renders it easy to make changes in individual items when needed, and to check the material as it arrives on the field.

13. Purchasers should insist that manufacturers use the purchaser's item numbering system in their proposal specifications. If this is not done, the checking and later negotiations and adjustments often become impossible tasks. It would be well for the N.E.L.A. and N.E.M.A. to come to some sort of understanding in regard to the numbering of items, particularly switching items.

14. Very often it is necessary to make changes in the specifications as the work progresses, and when the changes become numerous it is preferable to prepare a new specification and disregard the old specifications after having reached the necessary understanding about price adjustment, so that neither the old specification nor all the correspondence about the charges will have to be referred to again.

15. The most important part of a specification is not the specification itself, but the changes that are made later. As soon as any change is made, an understanding should at once be reached about the price adjustment and an immediate record should be made of all credits and extras. An engineer often makes small changes in the course of a discussion with a manufacturer, and if no record is made right then and there of the price adjustment, a bill for this change may be received a year later. If a record of the costs of all changes is made immediately, it is possible even to agree once a month or so that all extras or credits are closed to date, and that there will be no additional charges or credits unless new changes are made. This method was used by the author on a number of exceedingly complicated contracts with a great deal of success, and when the work was finished there was not a cent to adjust, to the great satisfaction both of purchaser and of manufacturer.

Inspections and tests do not imply distrust

Purchasers' inspections and tests are not for the purpose of ascertaining that the manufacturer is not "putting one over." If a purchaser has that little faith in a manufacturer he had better purchase his wares elsewhere. The true purpose of inspection is threefold:

First of all, it permits the purchaser's engineer to come in close contact with the manufacturer's engineer and brings about a better understanding of and a greater regard for each other's viewpoints. It gives the purchaser's engineer a better understanding of factory engineering, manufacturing facilities, production methods and production difficulties. After a few inspection trips he will write more intelligent specifications. On the other hand, the manufacturer's engineer will learn to appreciate the problems of the purchaser's engineer, and will soon find out that the latter is not necessarily crazy every time he insists on some small change which is not quite routine. This first purpose of inspection therefore is primarily educational and should be encouraged by all means.

The second purpose is to make sure that the lines of demarcation between the manufacturer and purchaser are satisfactory. In spite of all specifications and drawings, these lines are often mutually misunderstood and discrepancies in dimensions often occur which make installation difficult. It often happens, too, that the purchaser's engineer makes some changes in building conditions or similar designs, which call for changes in equipment, but either through rush of work or through negligence the manufacturer may not be advised of such

changes, and if the equipment is shipped unchanged there is endless trouble in the field. Such misunderstandings or required changes will often be found on inspection and rectified at the shop without a great deal of trouble. These two reasons make it obvious that it is advisable to have the purchaser's designing engineer function as inspector instead of having a special inspector who does nothing but inspecting.

The third purpose is to make factory subordinates, foremen and testers more careful in all the stages of fabrication and test technique.

Some inspectors make a nuisance of themselves at the factory, requesting unreasonable tests and reinspections, assume the attitude of distrusting the manufacturer, and generally upset production. Perhaps this is the reason why some manufacturers do not like to see customers' inspectors at their works. But such inspectors are the exception rather than the rule. Most inspectors know that they are not sent out to cause the manufacturer trouble, but to assist him. This unfriendly attitude on the part of some inspectors is also, no doubt, the reason why some manufacturers will not permit a customer's inspector to witness the usual shop routine test and insist, when a purchaser's witness test is specified, on finishing the routine shop test and then repeat it for the inspector. They fear that if any trouble should develop in the presence of the inspector, it would give them a bad reputation. Such attitude and extra expense are uncalled for. No purchaser will ever send out an inspector who has had so little experience that he does not know that some small trouble will frequently show itself in the first test, and that this is the purpose of tests, and that the discovery of such trouble does not in the least show poor design or poor production. He also must know that no matter how carefully he inspects and tests, he must trust the manufacturer in the end, because, for example, he cannot possibly proceed to calibrate all the instruments before each test. Summarizing:

1. Purchasers' inspections and tests should never be based on the idea that the manufacturer is not trusted.
2. Purchasers' inspections and tests are desirable because they help both sides to understand each other's viewpoints and help eliminate unintentional faults.
3. Manufacturers should invite and permit the purchaser's engineers to witness the shop routine test. But the inspector should be instructed by the purchaser that he is not to disrupt factory routine and that he is not to be unduly influenced by faults which the manufacturer himself is glad to find.

Exaggerated importance of guarantees

The importance of guarantees on equipment is greatly exaggerated, and for a number of reasons:

1. There is hardly a case on record where the manufacturer refused to make good on a product which was later found to be faulty, whether there was any specific guarantee or not.
2. A manufacturer's guarantee only refers to the equipment that he sells, and not to the cost of service interruption which a faulty piece of equipment may cause.
3. In the majority of cases of electrical apparatus failures it is almost impossible to establish definitely the cause of trouble, because the evidence is generally destroyed in the mishap. Where, for example, a breaker fails, it is almost impossible to prove the cause. It may have been faulty design, faulty production, neglect in maintenance or operation, and if nothing else can be thought of there is always old friend lightning as the last standby. It would seem that lightning was invented to be used as an explanation for all electrical troubles.

There are many other reasons why the importance generally attributed to guarantee clauses is exaggerated, but the principal one lies in the fact that most American business is based more on mutual trust and a mutual desire to continue doing business than it is on any written clauses. However, if guarantee clauses are to be used, it is necessary to ascertain that they are not exclusive. If certain guarantees are stipulated specifically, it may well be assumed that other things which are not so stipulated are not guaranteed.

There are certain things which have given rise to misunderstandings, and it would be well to mention them explicitly in the specifications. For instance, when the service of supervising erectors is to be furnished by the manufacturer, the service is generally stipulated on the basis of a per diem charge plus expenses. If no definite statement is made as to the number of days such erector will be required, disagreements often ensue. The equipment may be a new device, which calls for a great deal of experimenting, and it would not be quite fair to charge it all to the one installation. Or the article may be improperly produced and the time required to erect it is longer than it should be. Or the actual erection time may be quite reasonable, but the purchaser may think that it is not. In such cases it is important to make a definite stipulation in the specifications.

Important operating characteristics, such as outputs, efficiencies, temperature rises, etc., must be guaranteed, of course. But it is important to remember that it is useless to specify any guarantee which cannot be checked by measurements or tests at the factory or immediately after placing the equipment in service. Guarantee specifications that cannot be checked or that are too broad only cause misunderstandings and arguments that generally end nowhere.

Summarizing the subject of guarantees:

1. Guarantees of operating characteristics, such as rating of apparatus, efficiencies, temperature rises, etc., should be specified very explicitly and the method of determining whether or not the guarantees are met should be definitely given in the specifications.
2. Guarantee clauses covering features that cannot be checked by factory test or at a time immediately after installation in the field should be avoided.
3. Whenever the services of erectors or supervisors are charged per diem, a definite maximum number of days should be specified.
4. General broad guarantee clauses, such as "guaranteed for two years," or similar indefinite clauses which do not state exactly what the guarantee covers and do not specify a definite method of determining whether or not the guarantee is met, should be avoided.

Entertainment has its uses and its abuses

Entertainment is a very delicate and moot question. But a discussion of the relation between purchasers' and manufacturers' engineers would not be complete without including a reference to it. Besides, delicate questions should positively be discussed, because a discussion will take the delicate features out of them without making them indelicate. It has been customary since the dawn of history for those who have anything to sell to entertain their customers or prospective customers. Not that such customers are expected to place their orders with those who entertain them the most. The benefit which those who sell expect to get through entertaining is not quite so direct; it is more of an indirect nature. The principal object of entertaining is to help establish friendships, because when all things are equal, orders are

placed with friends, as they should be. Abuses in this field are few and far between. Entertainment to a reasonable amount has helped establish good and permanent friendships which have outlasted the relationship of seller and buyer. Conversely, friendships between those who abuse entertaining have been known not to be lasting. Such abuses are generally self-curing in very short order.

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No. 12 Wire Adds Little to Home Wiring Cost

So many comments have been made on the cost of wiring residences that the accompanying data, compiled by a joint committee on residence wiring standards and submitted to President Hoover's conference on home building, may be of interest. The data were obtained by asking contractors in ten cities to estimate wiring costs for houses of the value indicated, similar wiring specifications being given to each. Two contractors in each of the cities were asked to bid.

The committee warns that the specifications were the least that should ever be utilized, so that the total costs should not be considered so much as the relative values. Furthermore, the bids submitted vary from the amounts given, but the majority were fairly close to the average shown. Hence, these values represent the least that should be appropriated for wiring.

In view of the fact that No. 14 wire was intended primarily for limited lighting, and because of the increasing use of lighting as well as of appliances, the committee recommends the serious consideration of No. 12 wiring because of its small additional cost. The costs per outlet apply only to work done in a house being constructed. Outlets for medium duty service vary and ordinarily take a higher average price than the figures given.

Average Minimum Residential Wiring Costs*

	—Approximate House Value—		
	$3,500	$6,000	$8,500
Knob and Tube Installation No. 14 wire branch circuits	$79.15	$136.68	$217.94
Knob and Tube Installaton No. 12 wire branch circuits with three No. 6 service wires	87.68	148.56	235.28
Conduit Installation No. 14 wire branch circuits	121.28	225.05	361.85
Conduit Installation No. 12 wire branch circuits	131.56	246.17	380.02
Additional cost for electric range wiring	26.75	33.19	33.45

Per Cent of Structure Cost for Wiring Installation and Average Costs for Outlet*

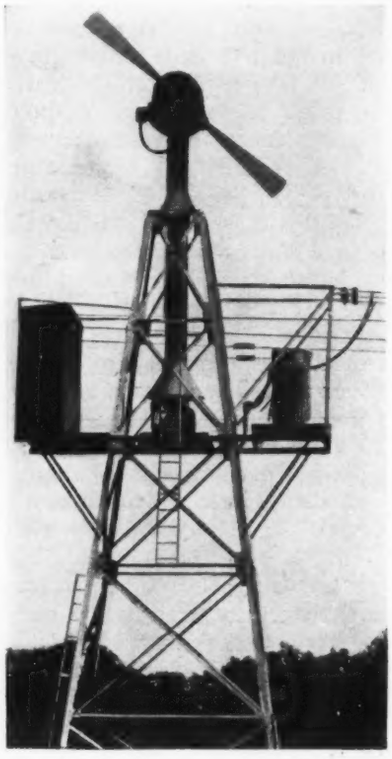
	Approximate Value of House					
	—$3,500—		—$6,000—		—$8,500—	
	Per Cent Allowance	Cost per Outlet	Per Cent Allowance	Cost per Outlet	Per Cent Allowance	Cost per Outlet
Knob and Tube Installation No. 14 wire branch circuits	2.3	$3.75	2.3	$2.85	2.6	$2.72
Knob and Tube Installation No. 12 wire branch circuit with 3 No. 6 service wires	2.5	4.17	2.5	3.10	2.8	2.94
Conduit Installation No. 14 wire branch circuits	3.5	5.78	3.8	4.69	4.3	4.52
Conduit Installation No. 12 wire branch circuits with 3 No. 5 service wires	3.8	6.26	3.9	5.13	4.5	4.75

* From addenda to "Wiring Specifications" submitted to President Hoover's conference on home building.

Motor-Driven Blower New Enemy to "Jack" Frost

For years smudge pots burning crude oil have been used to protect citrus fruit orchards of southern California against their deadly enemy, frost. Because of the smoke nuisance and the high cost of firing these pots there has been much experimentation with various means of protecting against frost. It has long been known that frost occurs only on cold nights when there is no breeze. Based upon this fact, various types of blowers have been tried, with varying degrees of success.

The latest of these is the Aladdin orchard protector shown in the accompanying illustration. Several of these have been in use in the San Joaquin Valley of California with entirely satisfactory results. The protector consists of a 45-ft. steel tower on which is placed an adjustable metal airplane propeller on a rotating shaft. The propeller is driven by a 100-hp. motor, while the supporting shaft revolves at one revolution in five minutes. Ball bearings are used throughout the gears and bearings are all submerged in oil. Platforms for a 100-kw., three-phase transformer and metering equipment are located as shown.



By keeping the air in motion on cold, still nights motor-driven propeller prevents frost

Users of these devices are authority for the statement that one machine will protect 10 acres of orchard against temperatures several degrees below freezing. Figures obtained from the power company indicate that the orchardist's investment is $3,000 per machine and the power company spends approximately $1,500 to provide service. Yearly minimum is $329 and revenue ranges from $428 to $791. Kilowatt-hour consumption varies from 4,520 to 21,400, depending entirely upon weather conditions.

Advantages claimed for the machine by users are elimination of carbon smoke, which permeates dwellings and damages furnishings; lower over-all cost for protection, thermostatic control if desired and better quality of fruit.

Men of the Industry

Boston Edison Officials Assume New Duties

The three Boston Edison executives who advanced in official status January 1, as announced in the January 2 issue of the ELECTRICAL WORLD, are all veterans in that utility's employ. Sidney Hosmer was named vice-president and assistant general manager, Leavitt L. Edgar vice-president in charge of the operating bureau and Irving E. Moultrop, chief engineer, was appointed head of the construction bureau.

Mr. Hosmer was graduated from Yale in 1892 and immediately entered the employ of the Mather Electric Company at Manchester, Conn. In 1894 he became associated with the Boston Electric Light Company and was general manager of that utility when it was consolidated with the Boston Edison

Leavitt Edgar

Notman Studios

Sidney Hosmer

company in 1902. Since that time he has served as superintendent of the construction bureau and was appointed a vice-president in March, 1926.

Leavitt L. Edgar, son of President C. L. Edgar, was educated at Harvard University, and upon completion of his studies in 1910 was employed for a short time by the General Electric Company. He entered the Boston company in 1911 and has been with that organization continuously with the exception of a two-year period of service in the World War. He was appointed vice-president in 1926 and in 1929 was elected to the board of directors.

Irving E. Moultrop, after an engineering apprenticeship and subsequent promotion to the post of chief draftsman of the Whittier Machinery Company, Roxbury, Mass., joined the Edison company in 1892. In 1913 he was appointed assistant superintendent of the construction bureau and in 1926 was named chief engineer. For his work in connection with the design and construction of the high-pressure steam installation at the Edgar station he received in 1929 the Elliott Cresson gold medal.

Mr. Atkins, one of the most highly esteemed executives in the Eastern electric utility field, entered the employ of the Boston company in 1887 as an inspector, and was subsequently advanced to the post of general superintendent.

Irving Moultrop

He has been identified with the development of the company in close association with Charles L. Edgar throughout a period marked by expansion in every branch of its activities. In 1926 he was appointed a vice-president. His leadership has been one of inspiration, both in the progressiveness of its outlook and in the stimulation of its guidance.

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E. W. LLOYD, vice-president of the Commonwealth Edison Company, Chicago, has been named chairman of the National Electric Light Association committee which will arrange for participation by that organization in the Chicago Century of Progress in 1933.

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CLAUDE L. DRAPER of Wyoming, who late in 1930 received appointment as a member of the Federal Power Commission for the one-year term, has been reappointed by the President and confirmed by the Senate for a full term of five years.

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CAPT. WILLIAM MCGREGOR, vice-president of the Blackstone Valley Gas & Electric Company, Pawtucket, R. I., was decorated with the cross of the French Legion of Honor last week in recognition of his services to France during the world war.

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H. K. BARROWS, consulting engineer, Boston, Mass., has been retained to investigate plans which have been prepared for the enlargement of the Sugar Hill reservoir, Goshen, N. H., owned by the Central Vermont Public Service Corporation.

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ERNEST A. BAMMAN has been elected a director and vice-president of the Utilities Capital Company, Inc., a corporation engaged in the financing and management of public utilities, with headquarters in New York City. Mr. Bamman was graduated in mechanical engineering from Cornell University and was for a time an instructor at Harvard University. More recently he has been engaged in construction engineering work.

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CHESTER H. LANG, formerly assistant manager of the publicity department and then comptroller of the budget of the General Electric Company, has been appointed manager of the publicity department to succeed Martin P. Rice, who retired December 31 after more than 37 years of service with the company. Mr. Lang, a native of Erie, Pa., was graduated from the University of Michigan in 1915. He entered the employ of the General Electric Company in 1919, immediately following his discharge from the army. After three years as a traveling auditor he was made assistant manager of what was then the publication bureau, which

later became the publicity department. He continued in this position until January, 1926, when he was appointed to the newly created position of comptroller of the budget of the company. Mr. Rice, a graduate of the University of Pennsylvania, entered the employ of the General Electric Company in 1895. When the publication bureau was organized, 35 years ago, he was made manager, and with the consolidation of this bureau with the advertising department, nine years ago, he became manager of the publicity department. In 1903 Mr. Rice established the *General Electric Review*, the technical magazine of the company. In 1921, when the General Electric Company became interested in radio broadcasting, Mr. Rice was made director of that activity. In this position he not only outlined the company's policy in this new field but established its three broadcasting stations.

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W. P. GEARY, rate expert for the Railroad Commission of California, has been appointed to the position of examiner on the commission. Mr. Geary's place as rate expert has been filled by the appointment of his assistant, Warren K. Brown, to that position.

•

ALLAN D. COLVIN, executive vice-president of the Connecticut Power Company, has been made the recipient of a twenty-year service pin. Mr. Colvin went to Hartford in 1911 and was made assistant to the general manager, subsequently becoming assistant general manager. He was appointed executive vice-president in 1929. He is a director of the Hartford Electric Light Company, Turners Falls Power & Electric Company, Manchester Electric Company and Union Electric Light & Power Company.

•

EVERETT S. LEE, an assistant engineer of the general engineering laboratory of the General Electric Company at Schenectady, has been appointed engineer of the laboratory to succeed the late Louis T. Robinson. Mr. Lee was graduated from the University of Illinois in 1913 with the degree of B.S. in E.E., and in 1915 Union College awarded him the degree of M.S. He entered test at the General Electric Company in 1913 and then went to Union College as an instructor in electrical engineering. Following the World War Mr. Lee entered the general engineering laboratory of the company, and in 1928 was made an assistant engineer of the laboratory. He was formerly chairman of the Schenectady section of the American Institute of Electrical Engineers and at present is a member of two national committees of the Institute. He is chairman of the sections committee and a member of the instruments and measurements committee.

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J. M. Donaldson New President of British Institution

John M. Donaldson, who was recently elected president of the Institution of Electrical Engineers of Great Britain, is not unknown to the electrical industry in this country, having engaged in engineering work in the United States and Canada early in his career. Mr. Donaldson was educated

at Whitgist grammar school, Croydon, England, and at the Finsbury Technical College and the Central Technical College. Following his arrival in America, he affiliated himself with the General Electric Company at Schenectady, where he remained for a year, from 1900 to 1901. Then he transferred his interest to Canada and joined the Montreal Light, Heat & Power Company, a connection he maintained until 1903.

Returning to England, he spent the next three years with the British Thomson-Houston Company, severing his connection with that organization to join the North Metropolitan Electric Power Supply Company in 1906 in the capacity of manager. It was in 1920 that he assumed the duties of chief engineer, the position he occupies at the present time. In addition to being actively identified with the Institution of Electrical Engineers of Great Britain, Mr. Donaldson has held membership for a number of years in the American Institute of Electrical Engineers.

OBITUARY

GEORGE JULIUS HOFFMEISTER, 55, electrical engineer of Vancouver, B. C., died at his residence in that city recently. Mr. Hoffmeister was born in Wellington County, Ontario.

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WALTER E. KLINGAMAN, manager of the Garner (Iowa) power plant for the Central States Electric Company of Cedar Rapids, Iowa, died December 30, at a Mason City hospital, following an operation.

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MARTIN TRACEY, for many years resident engineer at the Lake Buntzen power plant of the British Columbia Electric Railway Company and more recently electrical engineer of the Britannia Mining & Smelting Company, Britannia Beach, B. C., died recently. Mr. Tracey also had charge of the construction work at Lake Buntzen from 1908 to 1914, the No. 1 plant being enlarged and the No. 2 unit being completely constructed under his direction.

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RAYMOND S. MASSON, electrical engineer, died in Los Angeles, Cal., December 17, at the age of 61. Mr. Masson was identified some years ago with electrical construction in that state and until his health broke a year ago he was president of several electric companies in southern California and Mexico. Born in Hammondsport, N. Y., Mr. Masson was educated at Lehigh University and early in his career engaged in engineering work in Buffalo, Niagara Falls and in Pittsburgh and San Francisco. He was a member of the A.I.E.E.

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A. C. MAYER, merchandising manager of the General Electric refrigeration department, Cleveland, Ohio, was killed instantly the night of December 31 when an airplane in which he was flying from that city to his home in Louisville, Ky., crashed to the ground in a dense fog bank near Springfield, Ohio. Mr. Mayer, who was 39 years of age, joined the refrigeration department's sales organization as merchandising manager in August, 1927, after having been general sales manager for the Unit Construction Company in Chicago, Ill. Before that time he was a sales executive for the Victor Talking Machine Company in Camden, N. J. He was nationally prominent for his sales ideas and activities and was one of the outstanding sales experts in the electric refrigeration industry. Mr. Mayer had personally directed many successful sales campaigns for the General Electric refrigeration department and his tragic death occurred on the eve of the department's spring sales campaign.

Trade News

Buchler & Wolpin have been appointed general sales agents for the distribution of the C. E. Z. renewable fuse plugs and C. E. Z. refills, manufactured by the Automatic Electric Iron & Fuse Company, Philadelphia.

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Petroleum Electric Company has been appointed agent in the Oklahoma territory for the Allen-Bradley Company, Milwaukee, Wis.

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Announcement of the 1932 "Big 3" window display service on General Electric "Mazda" lamps has been announced by the Nela Park sales promotion department at Cleveland.

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Norge Corporation, Detroit, manufacturer of "Rollator" refrigeration, announce the addition of E. S. Ridgway, F. O. Fleischer, J. J. Davin and J. R. Blotcher to direct field selling operations as divisional managers. J. A. Sterling has been appointed to assist in sales promotion work.

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C. W. Bates has been appointed assistant sales manager of the switch and panel division of the Square D Company.

•

H. S. Glasby, associated with the Acme Wire Company of New Haven, Conn., has opened a sales office at 123 South Broad Street, Philadelphia. He will represent the National Harris Wire Company, the Macallen Company, the Waterbury Button Company, as well as the Acme Wire Company.

•

Announcement has been made that the Lukens Steel Company of Coatesville, Pa., has established in the Institute of Industrial Research, Pittsburgh, an industrial fellowship whose purpose is the scientific investigation of processes employed in the manufacture of steel plates. Erle G. Hill, who received his professional education at the University of California, has been appointed to the incumbency of this fellowship.

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Moloney Electric Company announces the appointment of N. H. Spencer as district manager of its Dallas office.

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Bra Bon Electric Company, Inc., Philadelphia, has been appointed agent for the Corning Glass Works.

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Automatic Screw Machine Products Company, Chicago, has been licensed by the Dardelet Threadlock Corporation to manufacture nuts and screw machine products threaded with the Dardelet self-locking screw thread.

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The Westinghouse Electric Elevator Company announces the appointment of Walker S. White as northeastern district manager of the Westinghouse organization with headquarters in New York City. Mr. White's territory takes in the entire northeastern portion of the United States.

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Gerald Hulett has been appointed sales promotion manager of Electromaster, Inc., Detroit.

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A. A. Uhalt has been appointed manager of the newly created dealer division of the General Electric Company, effective January 1.

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H. Peterson, formerly associated with Joy & Cox, has formed the Peterson Company and will represent Schweitzer & Conrad, Inc., in the states of Wyoming, Colorado and New Mexico.

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Pyrometer division of the Wilson-Maeulen Company, Inc., has been merged with the Foxboro Company, Foxboro, Mass.

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G. B. Warren has been appointed designing engineer of the steam turbine section and M. A. Savage designing engineer of the steam turbine generator section of the General Electric Company. J. H. Doran has been appointed assistant on mechanical design for the turbine engineering department and W. E. Blowney administrative assistant in the same department.

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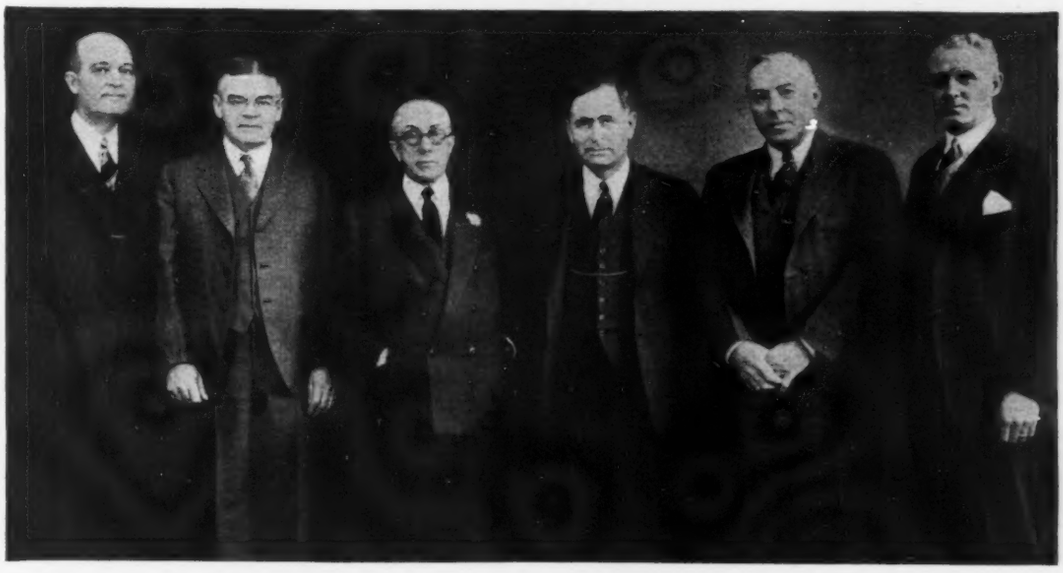
Westinghouse Electric Holds General Sales Conference

A four-day general sales conference was held at headquarters of the Westinghouse Electric & Manufacturing Company in East Pittsburgh lasting from December 14 until December 18.

Those participating included headquarters executives, district sales managers, subsidiary company officials and works managers.

Sales, policies, engineering developments and research progress were among the subjects discussed during the meeting. New and improved electrical products, for the home and industry, were explained by engineering managers responsible for their development. The extent of the 1932 market for electrical equipment also came in for discussion by regional representatives and headquarters sales managers of the various divisions of the Westinghouse sales organization.

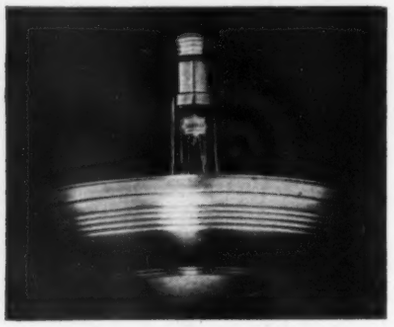


Left to right—C. E. Stephens, commercial vice-president with headquarters in New York; J. S. Tritle, vice-president and general manager; F. A. Merrick, president; N. G. Symonds, commercial vice-president with headquarters in Chicago; S. M. Kintner, vice-president, and W. R. Marshall, commercial vice-president with headquarters in San Francisco. All are officials of the Westinghouse Electric & Manufacturing Company.

New Equipment Available

150-Watt Indirect Unit Sans Installation Cost

An indirect unit of simple construction which can be retailed at a low price is announced by Silvray Lighting, Inc., New York. The unit employs a 150-



watt lamp and is so constructed that a smaller lamp cannot be used.

The unit used serves only to conceal the lamp from view. The lamp has a pure silver mirror covering the bowl as a protection to the eyes. The light is reflected from ceilings and wall giving totally indirect glareless, shadowless illumination.

No installation or wiring is necessary as the unit screws into any ceiling receptacle or suspended socket. It is of all-metal construction, non-tarnishing and finished in pewter.

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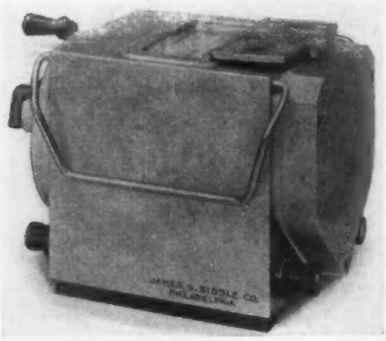
Ground Tester Measures Connection Resistance



To meet the need for a small, lightweight direct-reading instrument for measuring ground connection resistance, the James G. Biddle Company, Philadelphia, has developed the "Meg" ground tester. The new tester operates on the same principle as the "Megger" ground tester, which it supplements, having a self-contained hand generator that furnishes necessary alternating current for the test and a direct-reading pointer type ohmmeter.

The "Meg" ground tester is available with ranges up to 300, 600 and 1,000 ohms. The scales are logarithmic in character, being "opened up" at the lower end and calibrated in single ohms up to at least 20, then in larger units up to full scale values. While the "Megger" ground tester remains a superior instrument, wider in range and more accurate, particularly for fractional ohm grounds, the new "Meg" type has the advantages of equal simplicity, smaller size, lighter weight and lower cost.

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Air-Conditioning Unit for Home Use

An air-conditioning unit for attachment primarily to warm-air heaters equipped with a ¼-hp. motor for operating a high-speed, twin fan that keeps the home air constantly circulating through the air-conditioning unit is announced by the Holland Furnace Company, Holland, Mich. The fan draws the air through a copper mesh filter and then forces it through a series of water sprays. This filtering and washing process removes approximately 99 per cent of the dust and dirt from the air, it is claimed. The water sprays impinge against a unit termed an eliminator, through which the washed air passes, the washing water dripping off into the sewer, carrying with it dust and other impurities from the air.

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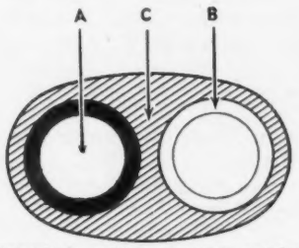
Central-Station Frequency Checker

The Hammond central-station frequency checker, when used together with any type of standard time clock having a second hand, is designed to afford simple, economical and highly accurate means for obtaining an absolute check of the frequency of the central-station output, so that time service may be rendered. In operation, a clear single-stroke bell indicates five-second intervals as interpreted by the central-station frequency, permitting the operator to face the standard time clock and uninterruptedly observe its moving second hand for comparison. It has been developed by the Hammond Clock Company, Chicago.

Rubber-Sheathed Twin Lamp Cord

A new type of rubber-sheathed twin lamp cord is announced by the Simplex Wire & Cable Company, Boston, under the trade name "Latox." It is a small, clean, durable cord with a thin covering



A. Stranded, cotton wound conductor.
B. Thirty per cent Para rubber insulation.
C. Sixty per cent Latox rubber sheath.

or sheath of tough rubber in place of the usual silk, rayon or cotton braids. Unique principles of design never before used in lamp cord construction result in a safer, longer-lived, cleaner and more satisfactory cord, it is claimed. The "Latox" rubber sheath is a new type of rubber compound containing a high percentage of rubber and made directly from rubber latex. The rubber sheath completely surrounds each conductor, holding it in position and insuring against short circuits.

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Inclosed Fuse and Resistor Assembly

An inclosed fuse and resistor assembly for potential transformer application, each unit consisting of an S&C RR resistor, 22½ ohms, 1 amp., inclosed in a dustproof housing and an S&C type BR fuse, has been announced by Schweitzer & Conrad, Inc., Chicago. These units are inclosed in a fiber housing, equipped with end bells and insulated terminal connections. The fuse is supported by clips attached to the removable cover so that when the door is pulled from the housing the fuse is removed at the same time. The rating of this assembly is 4,400 volts, 22½ ohms, 1 amp.